

HONDA

ES3500

GENERATOR

PROVISIONAL SERVICE INFORMATION

*Destroy this interim service information
when the permanent shop manual becomes
available.*

AMERICAN HONDA MOTOR CO., INC.
MOTORCYCLE AND POWER PRODUCTS SERVICE DEPARTMENT

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I-1. SPECIFICATIONS

DIMENSIONS AND WEIGHTS

Overall length	715 mm (28.2 in.)
Overall width	405 mm (15.9 in.)
Overall height	595 mm (23.4 in.)
Dry weight	87.5 kg (193 lbs)
Curb weight	99.0 kg (218 lbs)

GENERATOR

Type	Self-exciting, 2-poles, single phase, rotating field type
Rated output	AC: 2.8 KVA DC: 100W (12V, 8.3A)
Max. output	3.5 KVA (Max. 1 hr)
Rated voltage	115V/230V
Rated current	24.3A/12.2A
Rated frequency	60Hz
Voltage regulating system	A.V.R. (Automatic Voltage Regulator) system

ENGINE

Model	HONDA G80 gasoline engine
Type	4 cycle, side valve, 1 cylinder
Total displacement	296 cc (18.0 cu.in.)
Rated horsepower	6.0 ps/3600 rpm
Max. horsepower	8.0 ps/4000 rpm
Max. torque	1.6 kg-m (11.6 lbs-ft)/2500 rpm
Compression ratio	6.3: 1
Fuel consumption	285g/ps-h
Cooling system	Forced air cooling
Ignition system	Flywheel magneto
Ignition timing	25° B.T.D.C. fixed
Spark plug	B-6HS, BR-6HS (NGK)
Carburetor	Horizontal type, butterfly valve
Air cleaner	Semi-dry type
Governor	Sentrifugal governor
Lubricating system	Splash type
Oil capacity	1.1l (2.3 U.S. pt., 1.9 Imp. pt.)
Starting system	Electric/Recoil Starter
Stopping system	Ground of primary circuit
Tank capacity	14l (3.7 U.S. gal., 3.1 Imp. gal.)

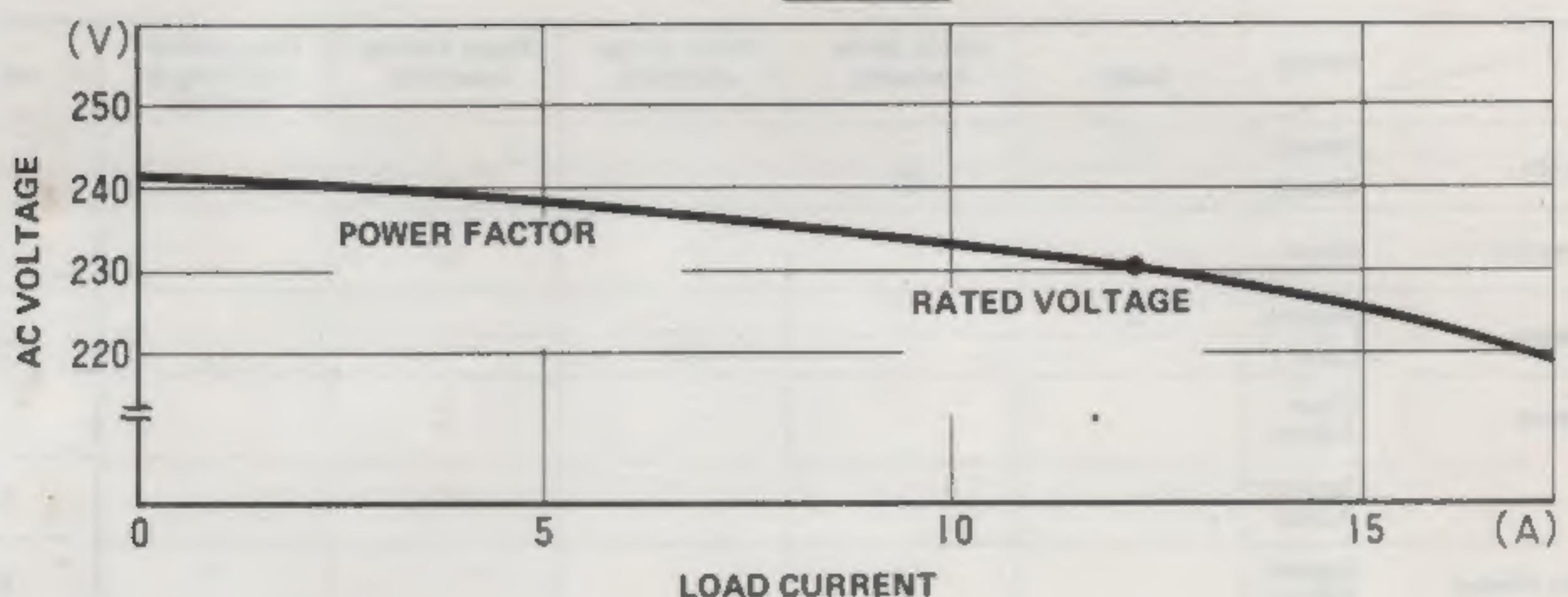
I-2. CHARACTERISTICS

Voltage variation rate	Momentary: 15% max. Average: 7% max. Average time: 5 minutes max.
Frequency variation rate	Momentary: 20% max. Average: 10% max. Average time: 5 minutes max.
Stability in voltage	±1%
Stability in frequency	±1%
Rated power factor	0.8-1.0
Insulation resistance	10 MΩ
Max. load	110%
Circuit breaker capacity	31.5A/115V, 16A/230V
DC fuse capacity	15A
Fuel consumption ratio (at rated load)	25l/h
Motor drive	750W max.

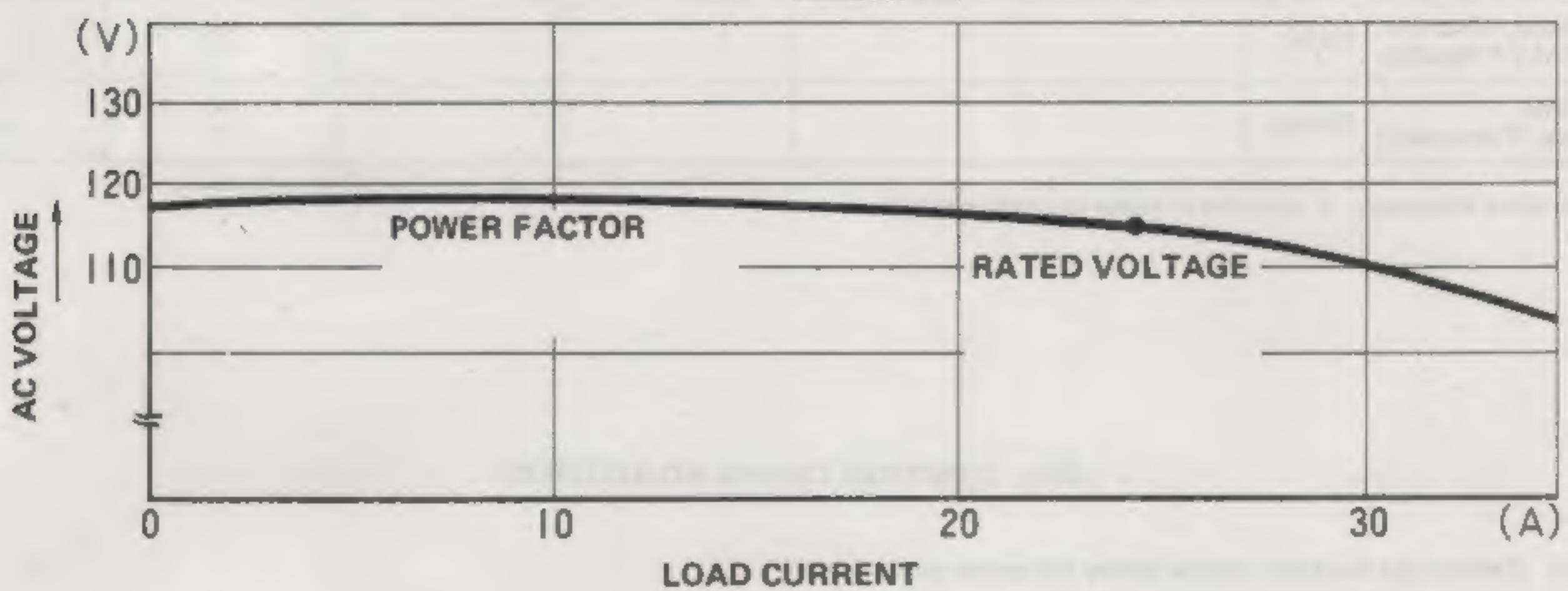
I-3. PERFORMANCE CURVES

•AC OUTPUT

AC 230V

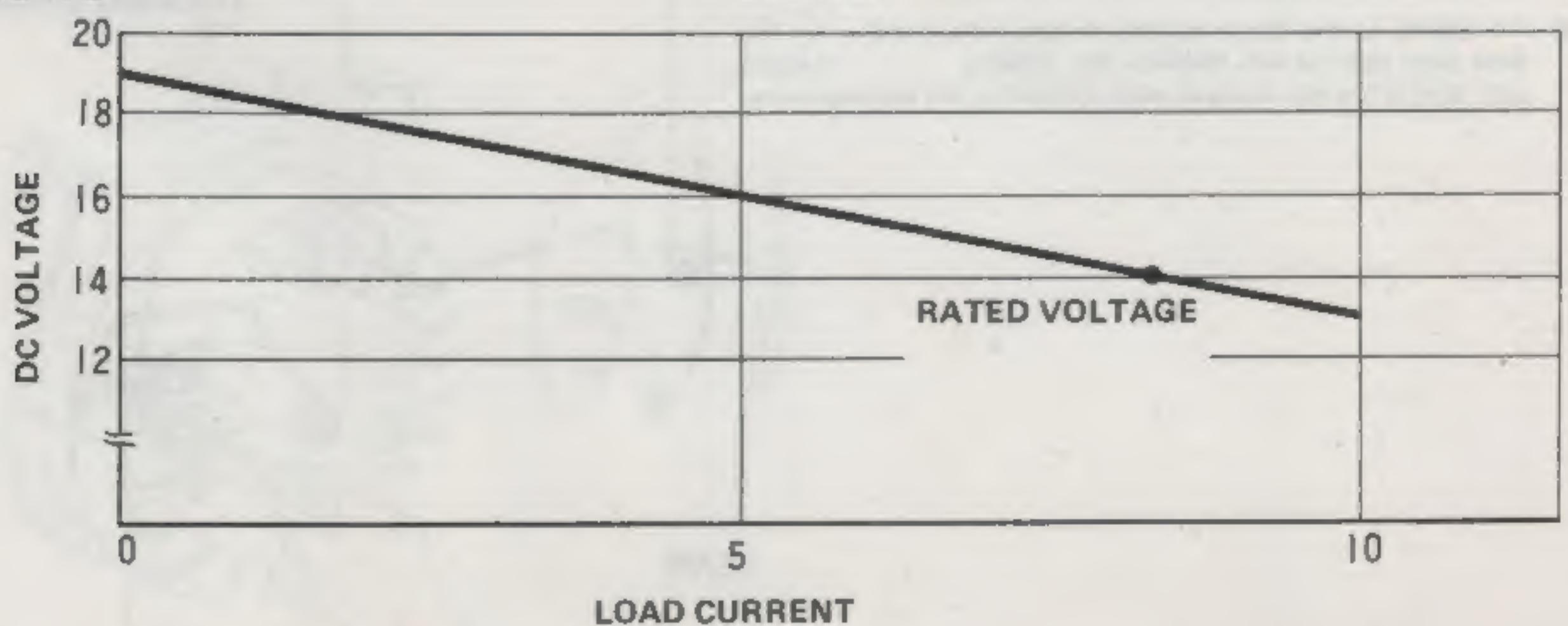


AC 115V



•DC OUTPUT

DC 12V



*These performances may vary in some degrees depending on the ambient temperature and humidity.

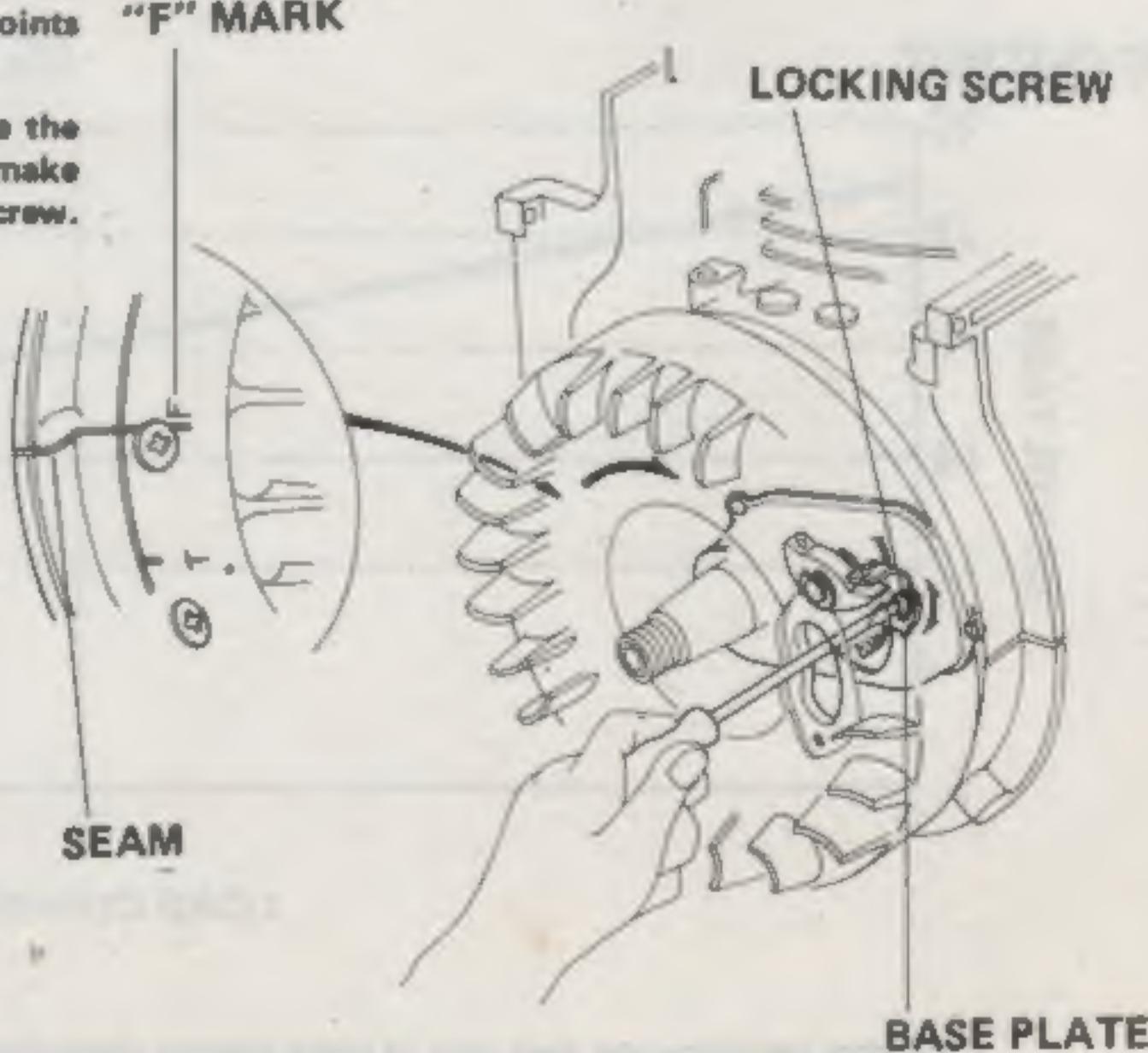
II-1. MAINTENANCE SCHEDULE

Items	Period	Daily	Initial 20 hrs operating	Every 50 hrs operating	Every 100 hrs operating	Every 300 hrs operating or annually	Ref. page
Engine Oil	Inspect Change	○	○		○		
Fuel Strainer	Clean				○		
Air Cleaner	Inspect Clean	○		○*			
Spark Plug	Clean Adjust				○		
Belt	Inspect Adjust				○		P. 15
Ignition Timing	Inspect Adjust					○	P. 4
Tappet Clearance	Inspect Adjust					○	P. 5
Combustion Chamber (inc. VALVE lapping)	Clean					○	
Fuel Tube (Replace, if necessary)	Change					○	

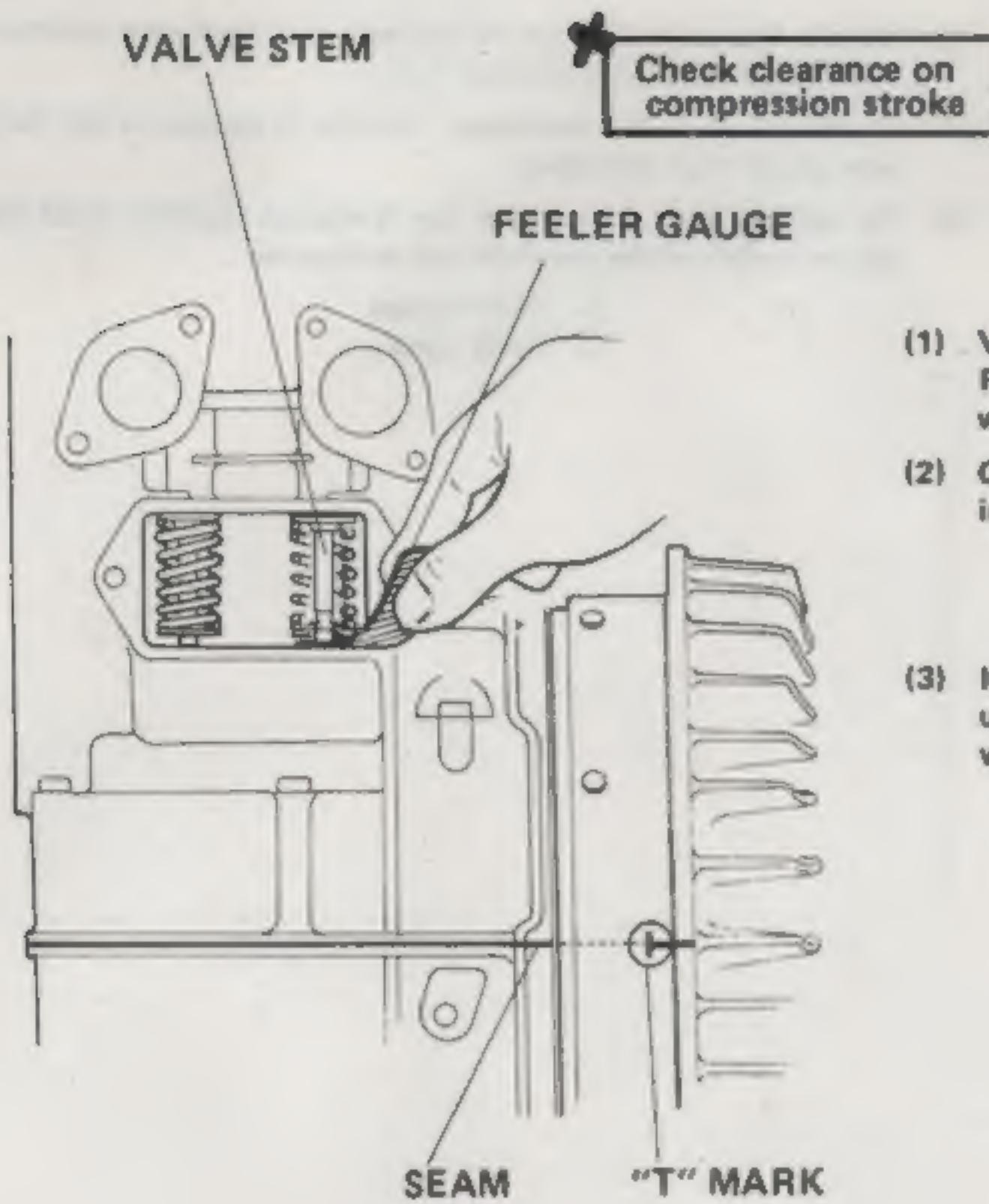
* Clean more frequently, if operated in dusty or sandy conditions.

II-2. IGNITION TIMING ADJUSTMENT

- (1) Remove the fan cover, starter pulley and point cover.
- (2) Rotate the flywheel in a clockwise direction until the "F" mark on the flywheel aligns with the seam between the cylinder and oil pan. At this time, the contact breaker points should just start to open. (25 B.T.D.C., FIXED)
- (3) To adjust, loosen the base plate locking screw, and move the base plate right or left. Recheck the timing to make sure that it has not changed, after tightening the locking screw.



II-3. TAPPET CLEARANCE ADJUSTMENT



- (1) Valve tappet clearance should be checked with the engine cold. Rotate the flywheel until the "T" mark on the flywheel aligns with the index mark with the piston on compression stroke.
- (2) Check the clearance of both the inlet and exhaust valves by inserting a feeler gauge between the valve stem and lifter.

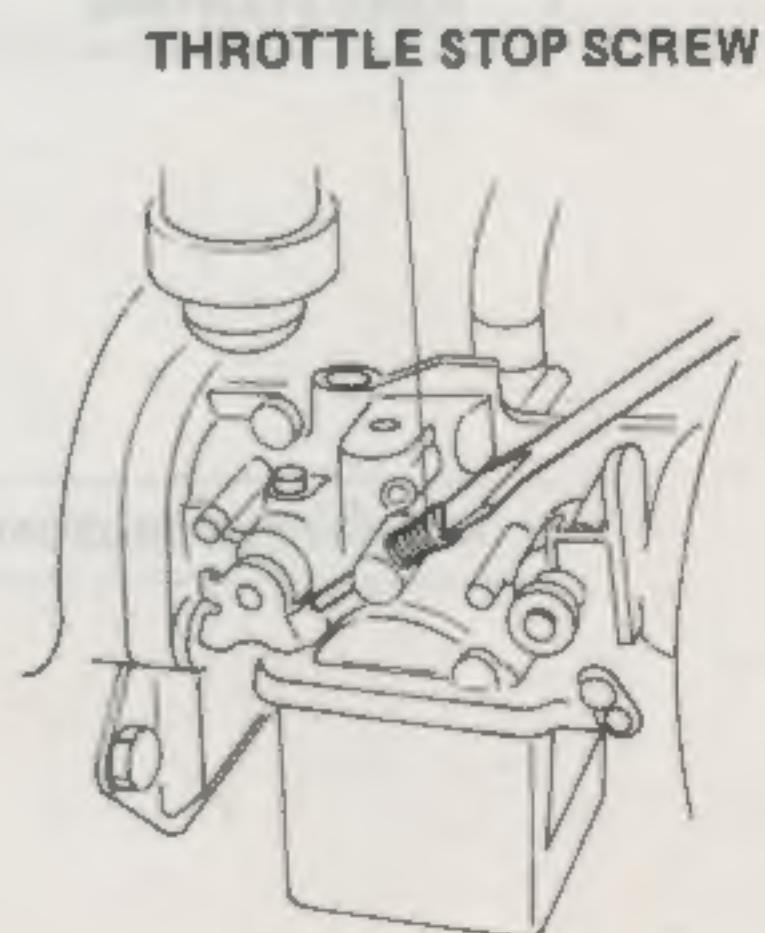
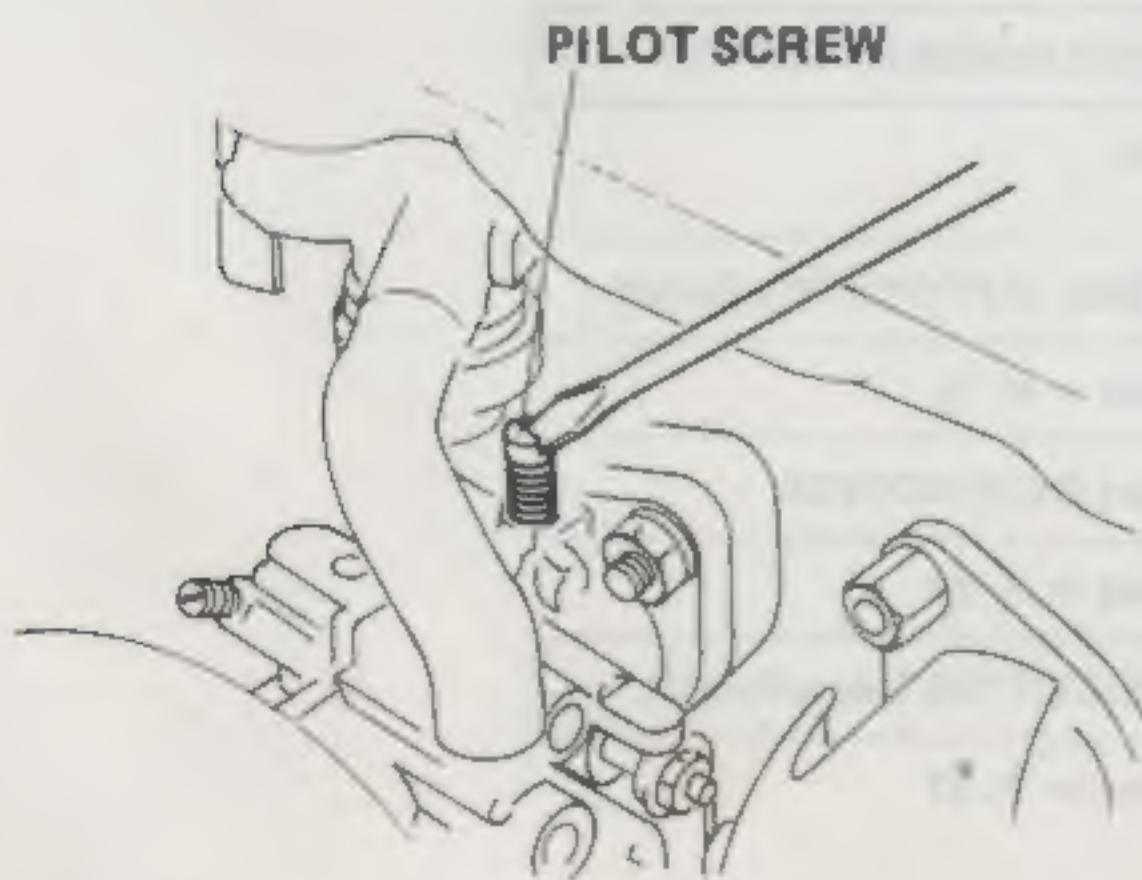
Standard 0.06–0.11 mm (0.002–0.004 in.)

- (3) If the clearance is too small, adjust by grinding the stem end using an oil stone. If the clearance is excessive, discard the old valve and install a new one.

II-4. CARBURETOR ADJUSTMENT

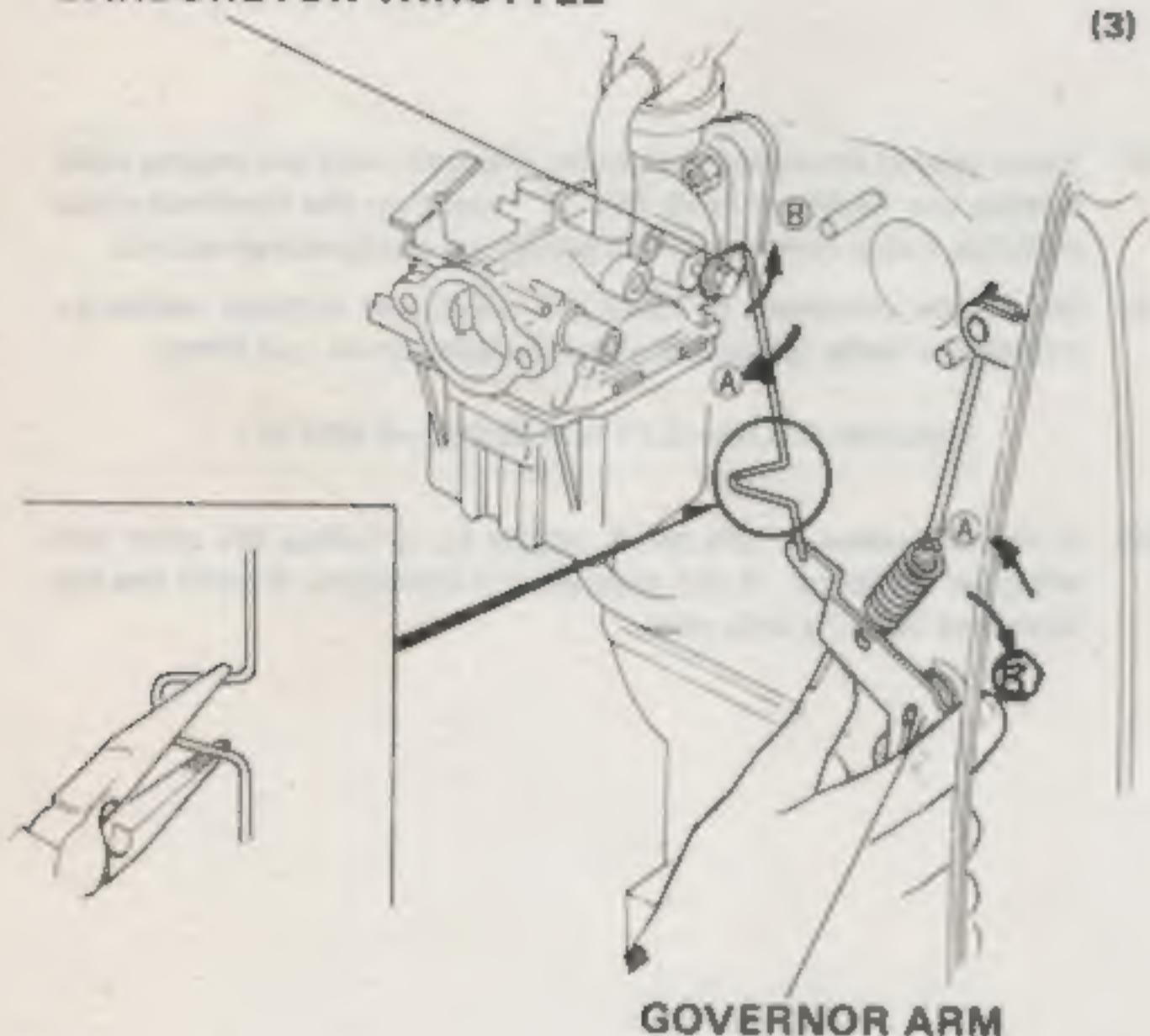
- (1) Turn in the pilot screw until it lightly bottoms against the seat, then turn out 1-7/8 turns.
- (2) Start the engine and turn the throttle stop screw either in or out as necessary until the correct idle speed is obtained.

Specified Idle Speed: 1,400 rpm



II-5. GOVERNOR ADJUSTMENT

CARBURETOR THROTTLE

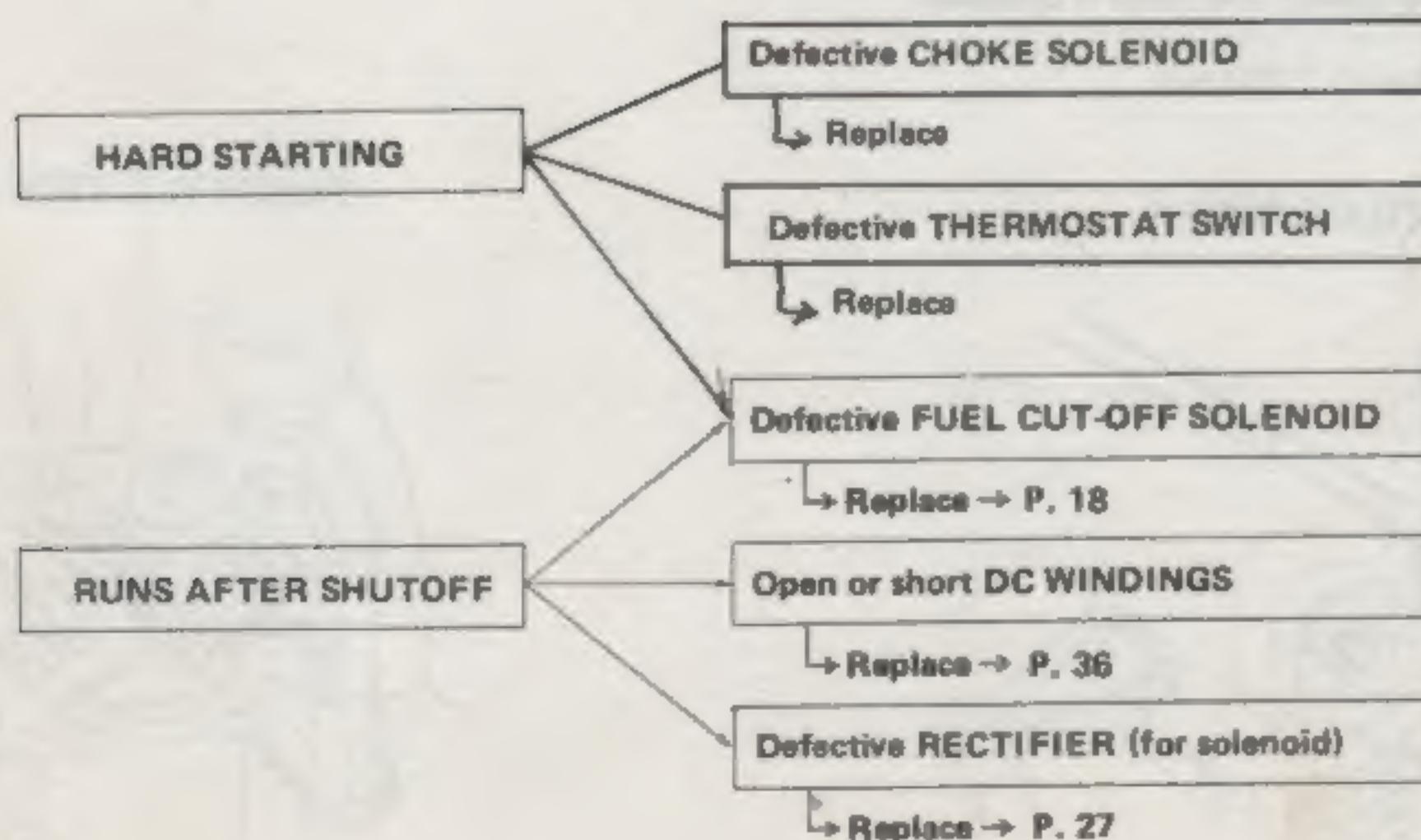


- (1) Rotate the governor arm all the way in a clockwise direction (the governor weights contract fully).
- (2) Make sure that the carburetor throttle is turned to the fully open position at this time.
- (3) To adjust, bend or expand the V-shaped position until the proper length of the governor rod is obtained.

A Fully closed
B Fully open

TROUBLESHOOTING

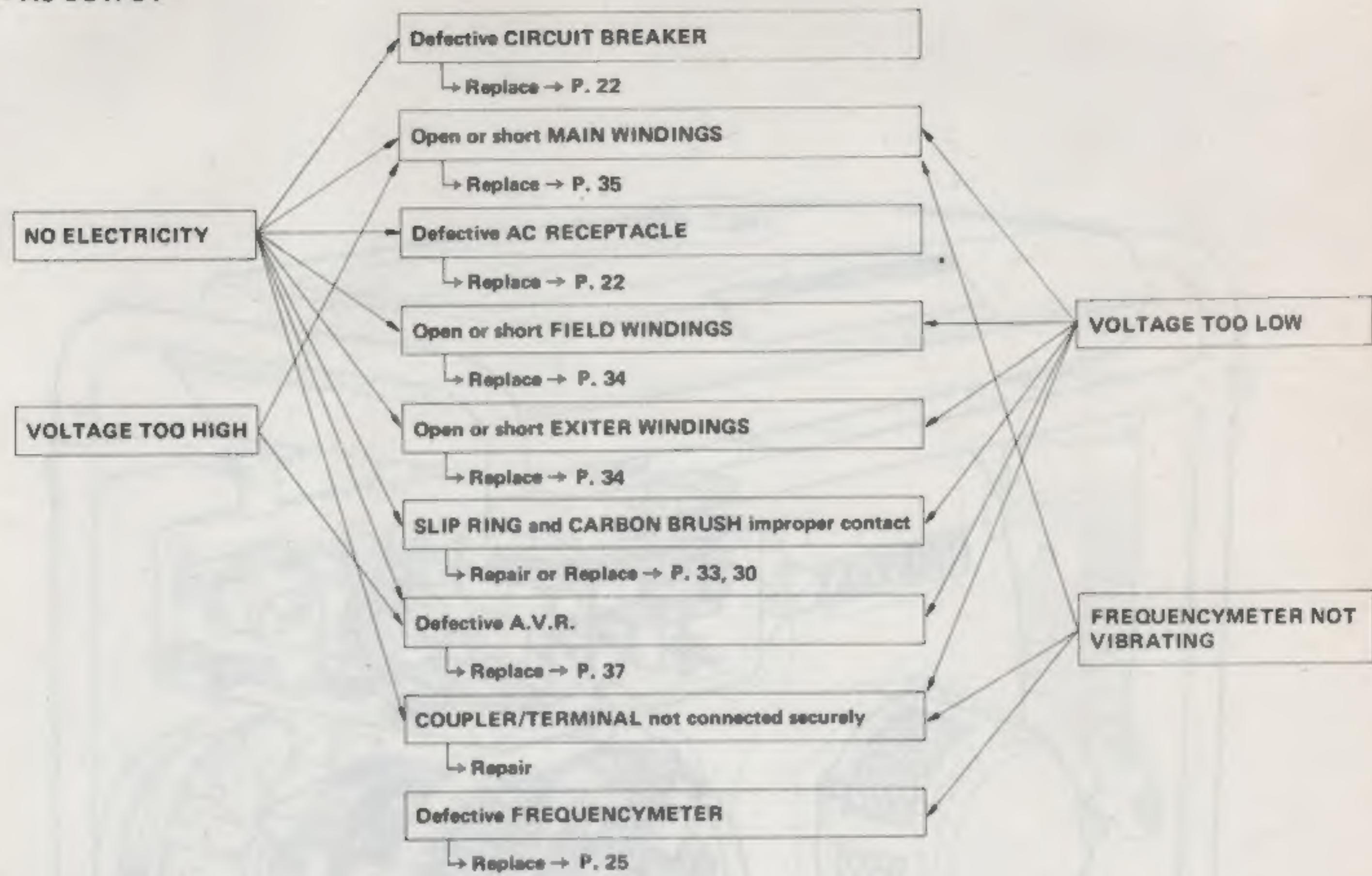
ENGINE



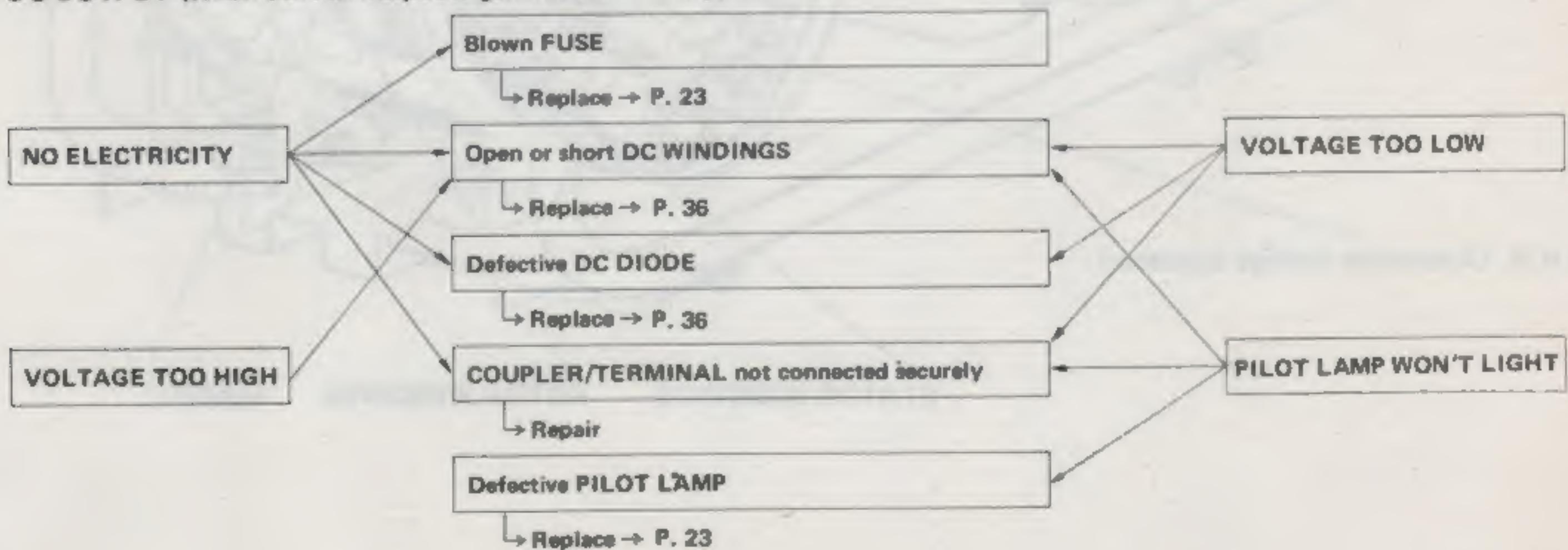
TROUBLESHOOTING

GENERATOR

• AC OUTPUT

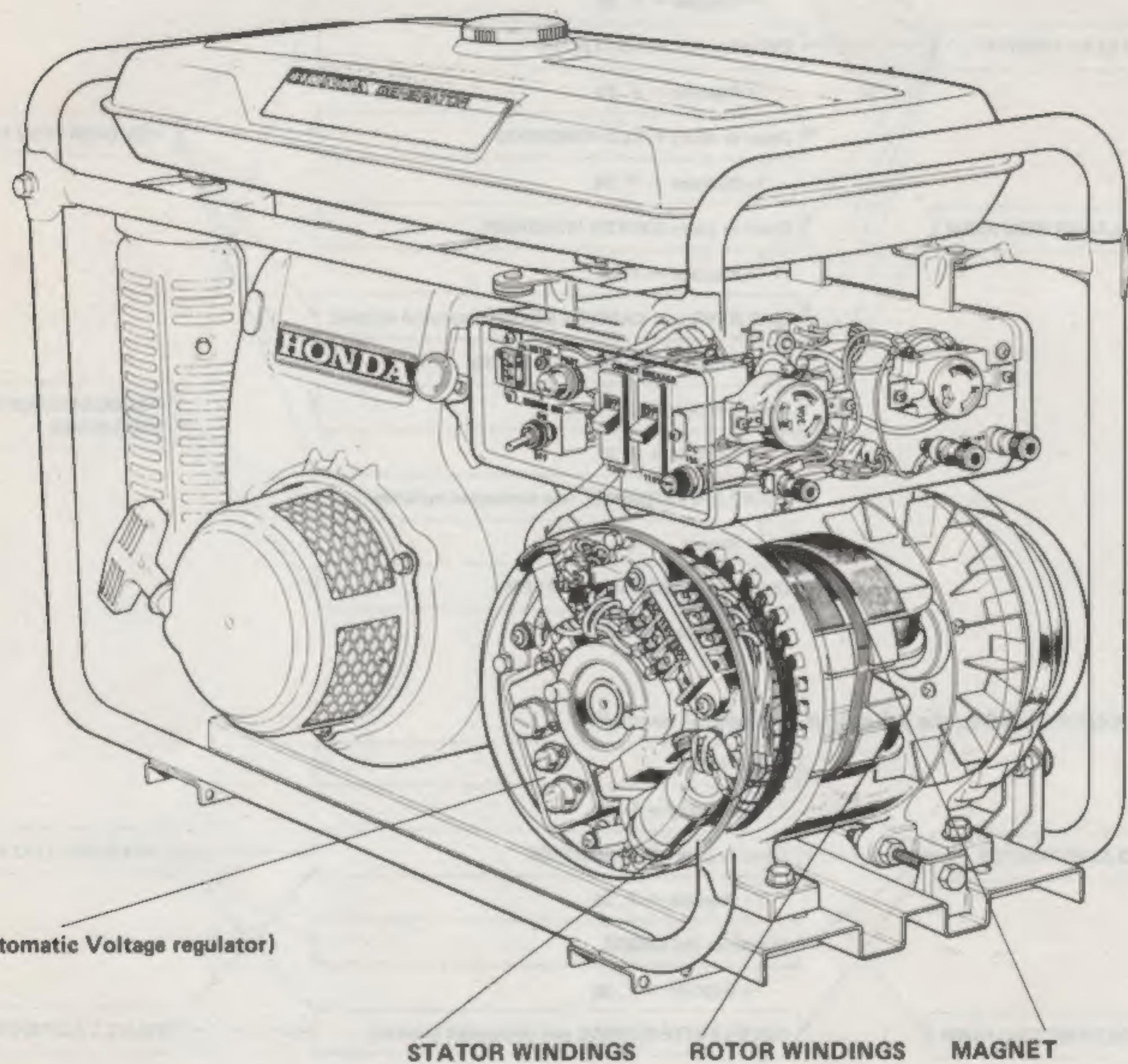


• DC OUTPUT (When the AC output is generated normally:)



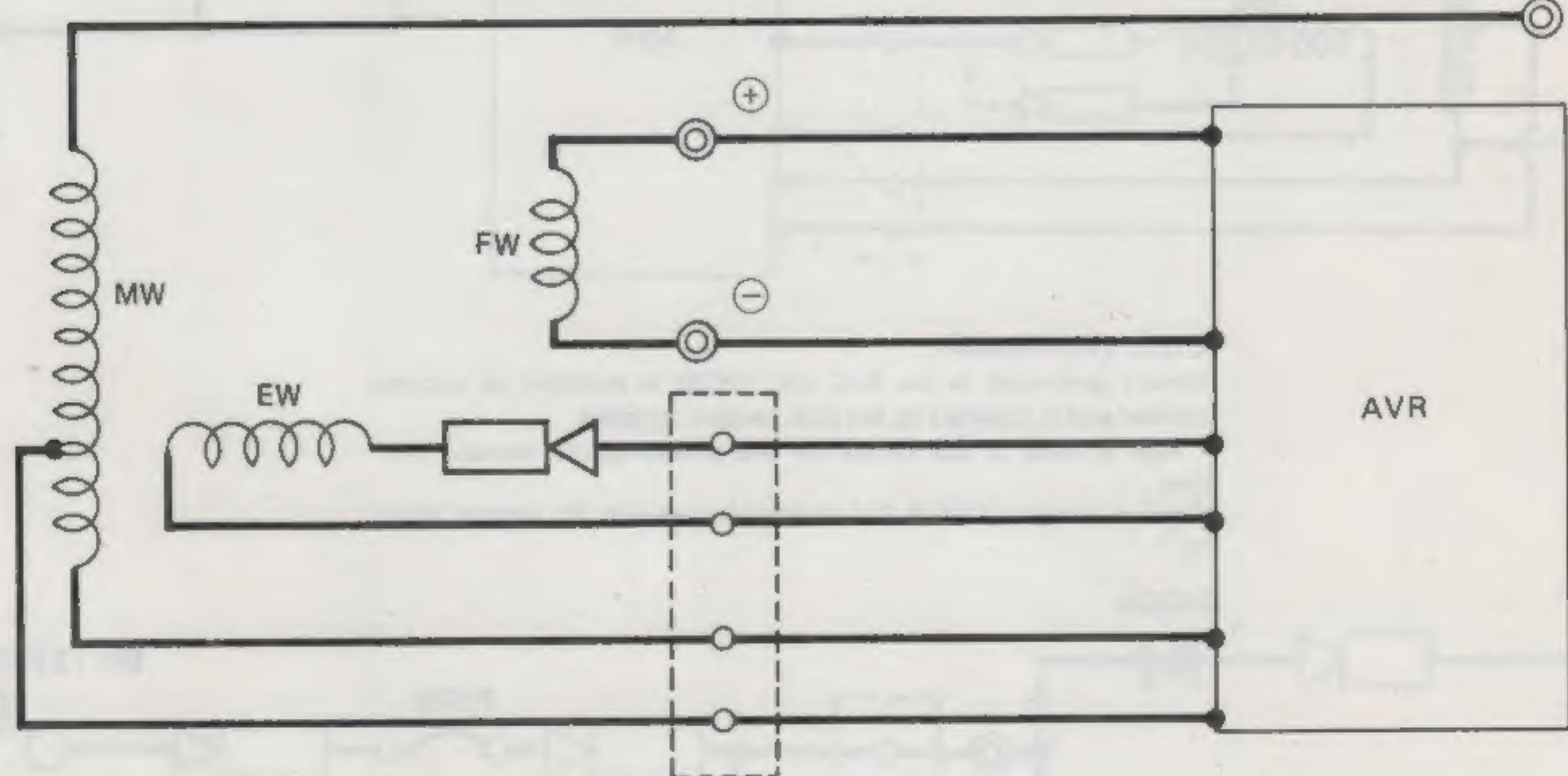
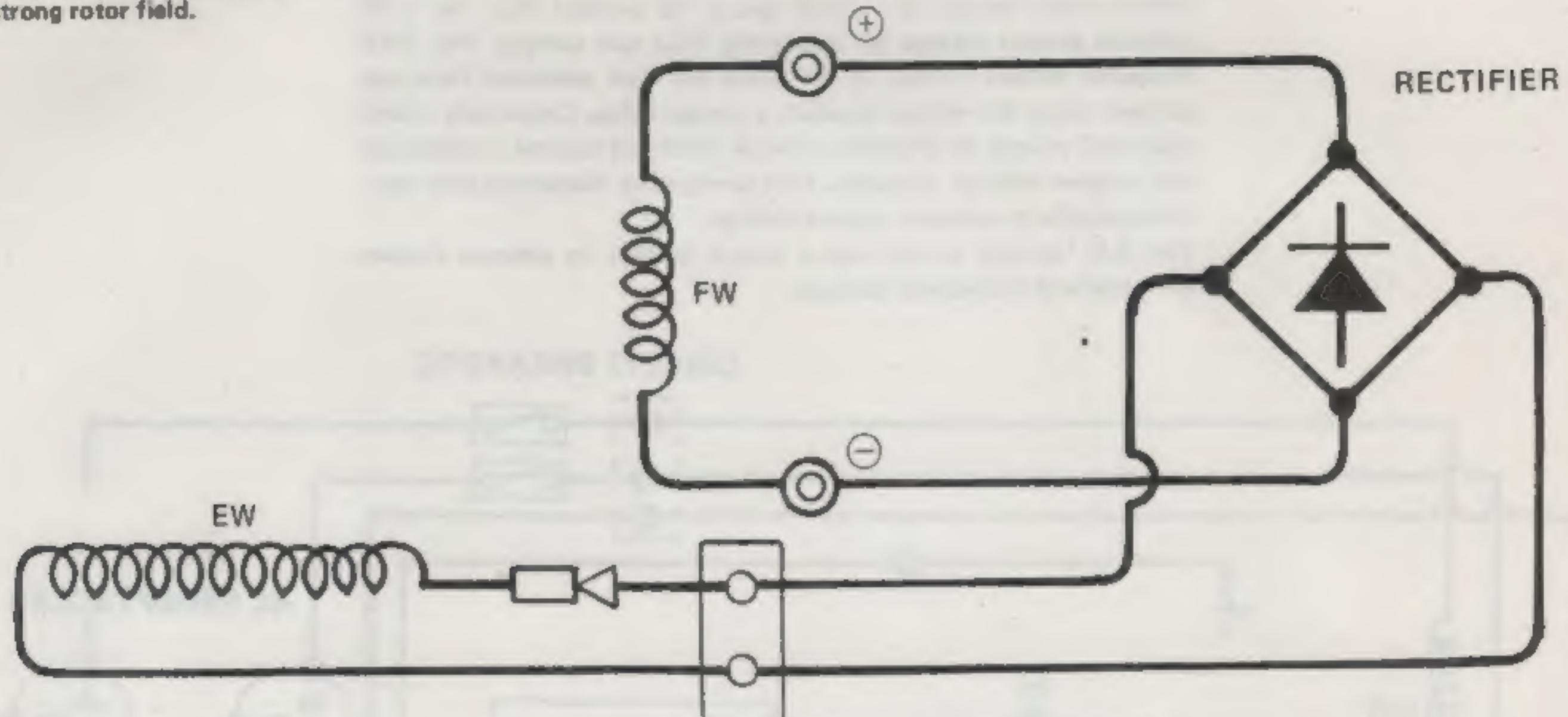
GENERATING SYSTEM

The HONDA ES3500 generator employs a rotating field generating system. The rotor has a relatively weak permanent magnet with two poles, N and S, and contains the field coil (FW). The stator consists of the main coil (MW) and exciter coil (EW), wound on the laminated cores attached to the generator housing.



GENERATING CIRCUIT

The stator's exciter coil (EW) supplies direct current to the rotor's field coil (FW) through a rectifier in the AVR and brushes contacting the rotor. As the rotating field coil's magnetic flux is cut by the stator windings, alternating current is generated in the main coil (MW) for output, and in the exciter coil (EW) for maintaining a strong rotor field.



1) Exciter Circuit

The rotor permanent magnet provides initial exciting current. As the engine starts and the rotor begins to turn, the N and S pole's magnetic flux is cut by the windings on the stator's exciter coil (EW). This induces alternating current in the exciter coil, which is then converted to direct current by a rectifier in the AVR and fed back to the rotor's field coil (FW) to strengthen the rotor's magnetic field.

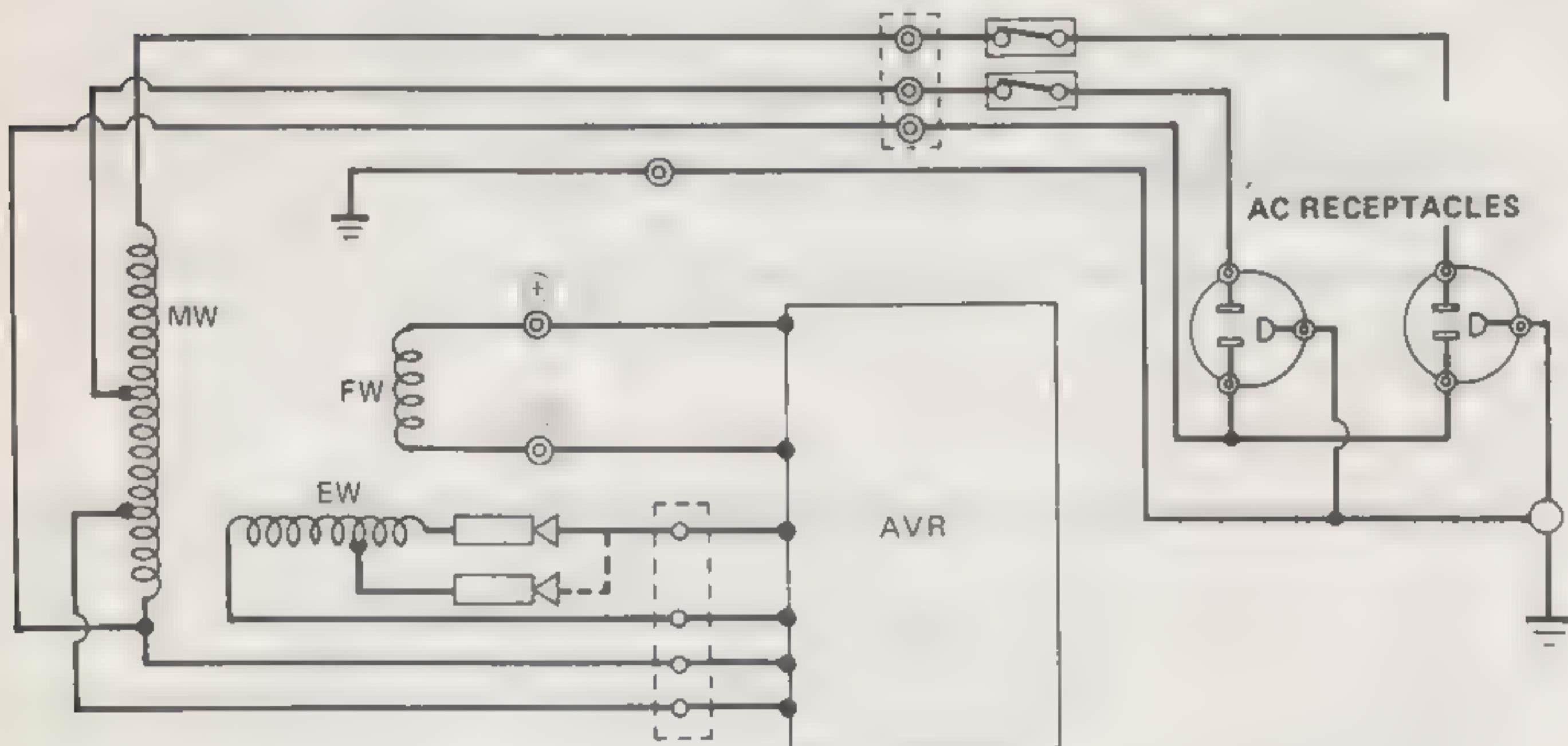
2) A.C. Output Circuit and AVR (Automatic Voltage Regulator)

As direct current flows through the rotating field coil (FW), alternating current is generated in the stator main coil (MW). The induced AC output voltage is proportional to both rotor speed and field coil current.

The ES3500 generator reaches specified output voltage at 2,000 - 2,500 rpm, well below normal operating speed: 3,000 rpm (50HZ), 3,600 rpm (60HZ). Without some control, output voltage would exceed rated output at normal speed. To prevent this, the AVR controls output voltage by regulating field coil current. The AVR measures output voltage in the main coil and decreases field coil current when the output exceeds a pre-set value. Conversely, when main coil voltage drops below normal, field coil current is increased, and output voltage increases. This continuous measuring and regulating results in constant output voltage.

The A.C. output circuit has a circuit breaker to prevent current overload and subsequent damage.

CIRCUIT BREAKERS



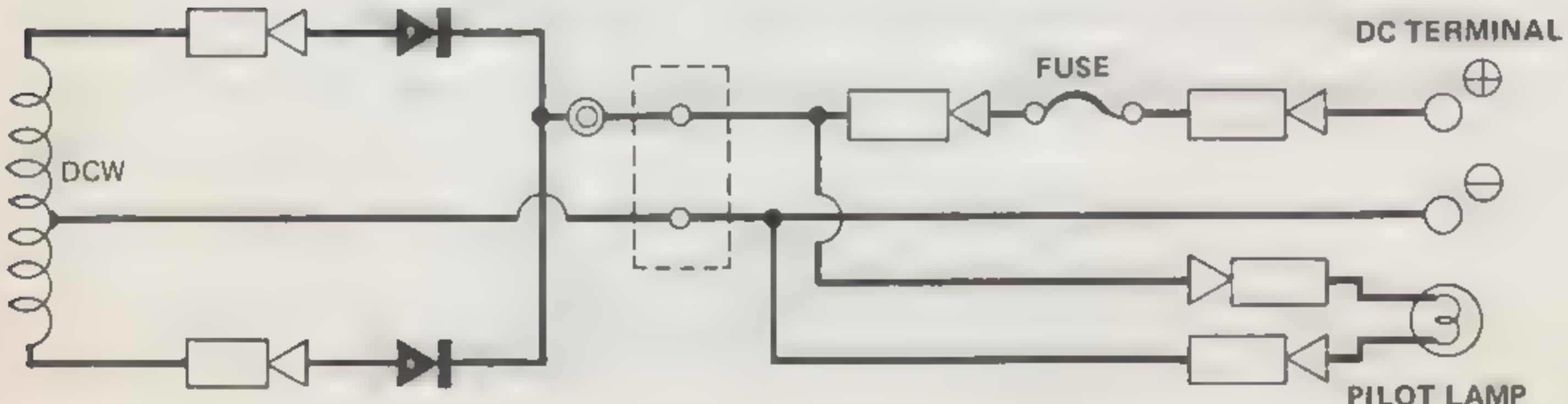
3) D.C. Output Circuit

Current generated in the D.C. coil (DCW) is rectified by another rectifier and is supplied to the D.C. output terminal.

A fuse is used in the circuit for protection against current overload.

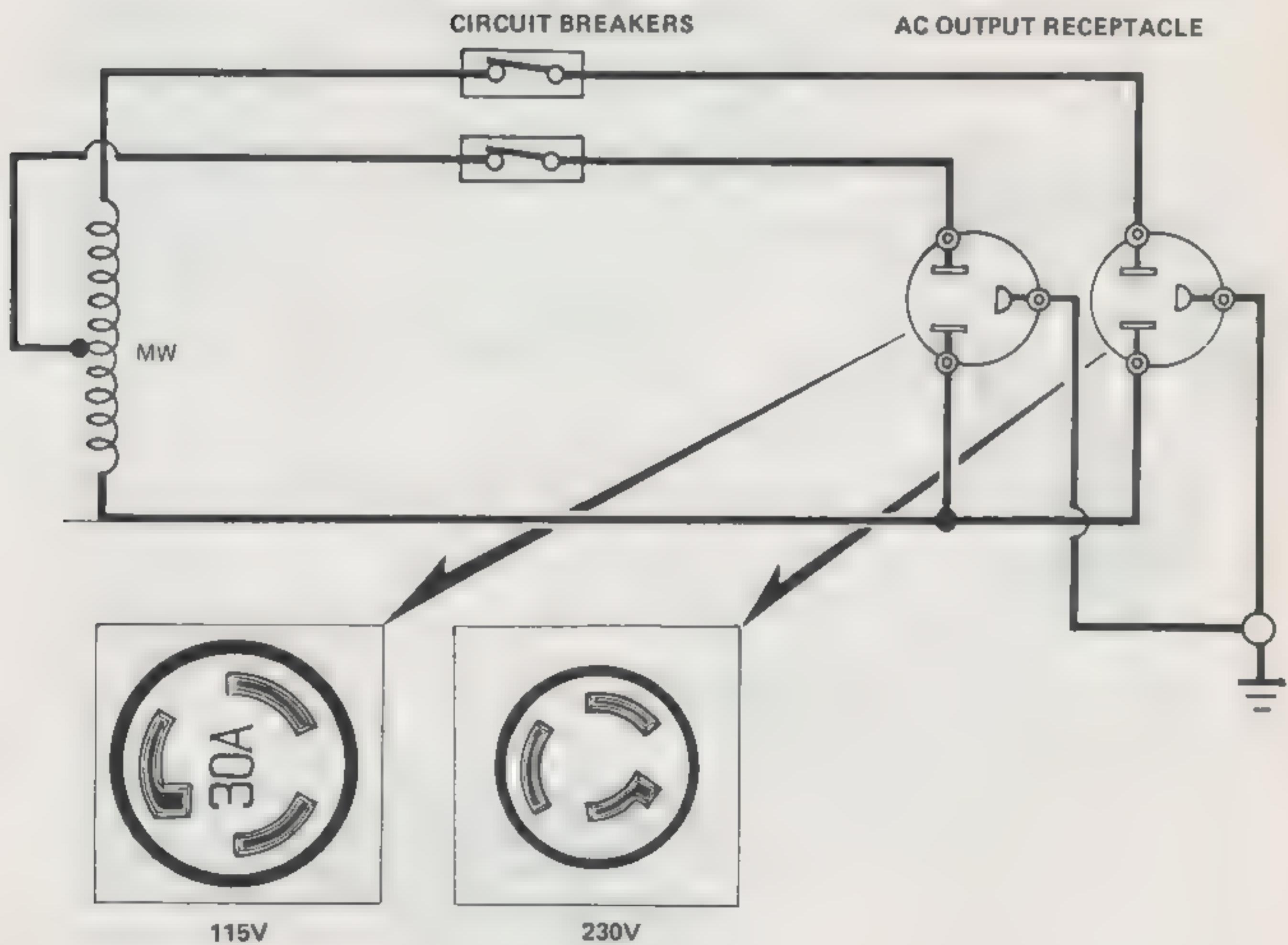
This D.C. output (12V, 8.3A) should be used only for battery charging.

DIODE

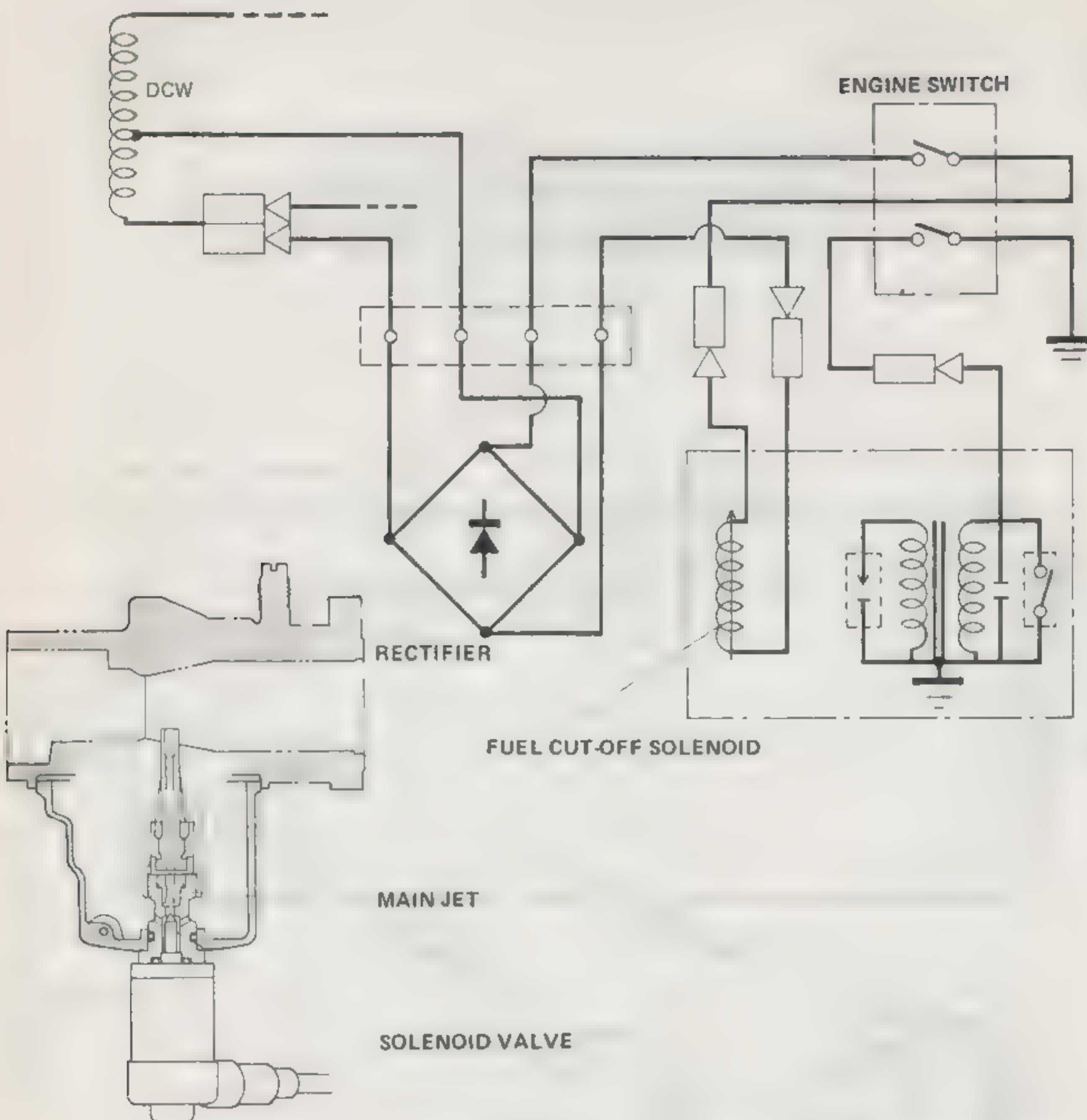


DUAL OUTPUT VOLTAGE

The E3500 generator employs a dual output voltage system in which both 115V and 230V outputs are available at the same time. It accomplishes this by providing a center tap in the main coil (MW) (changing the resistance). Each circuit has its own circuit breaker and an independent output plug with a different pin lay-out preventing a miss-connection.



FUEL CUT-OFF SOLENOID VALVE



The generator incorporates a fuel cut-off solenoid valve to prevent "dieseling" when shutting off the engine.

When the engine switch is turned off, in addition to an usual stopping system grounding the primary circuit, the solenoid valve is energized by the current from the generator, closing the carburetor main jet to cut off the fuel supply.

Current from the D.C. coil (DCW) is rectified by a diode rectifier before entering the solenoid valve.

AUTOMATIC CHOKE MECHANISM

The ES3500 generator has an automatic choke for convenient starting, especially with the optional remote control. When the engine switch is turned to "START", the battery energizes a choke solenoid to close the choke for cold starting.

When the engine reaches 30°C (86°F) at the cylinder head, a thermostswitch turns off the solenoid to open the choke.

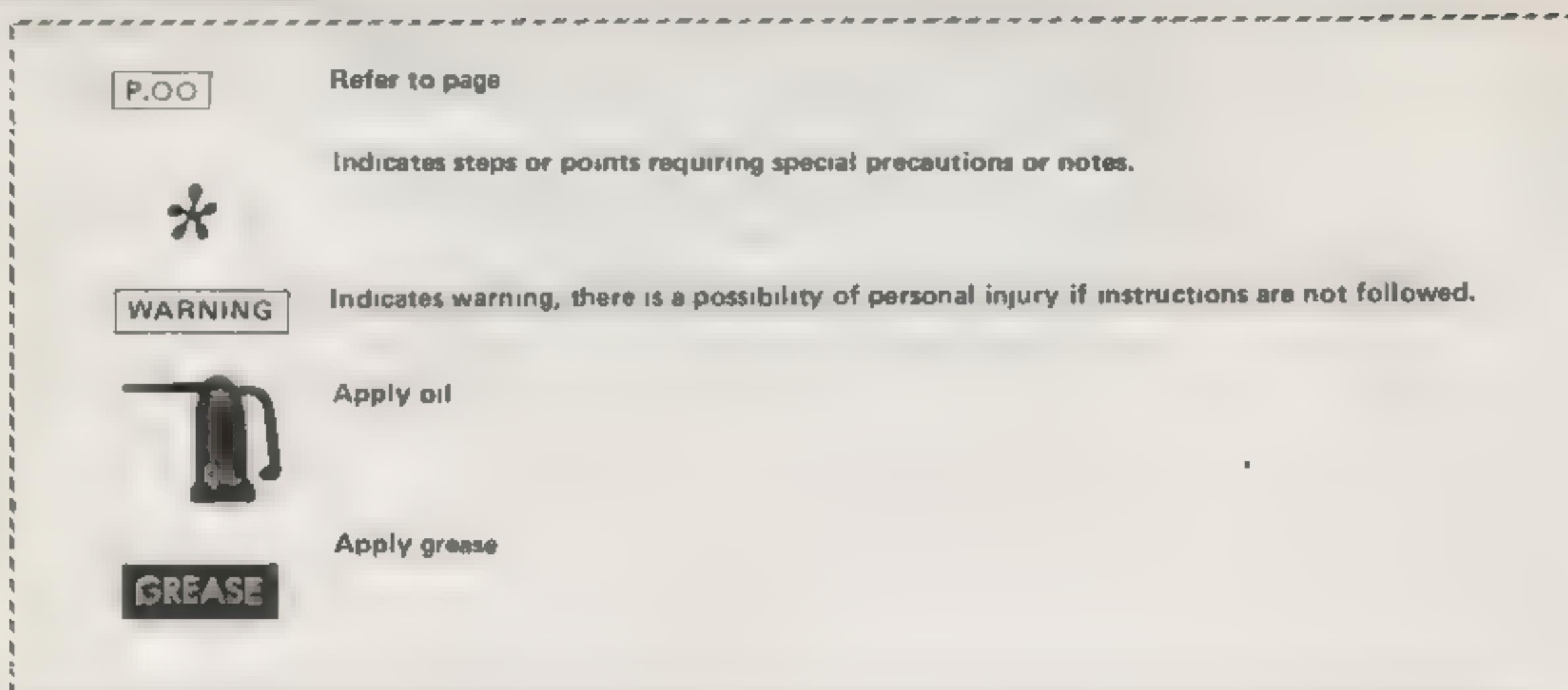
A manual choke is also provided for use when the battery is discharged, or when using the recoil starter.

REMOTE CONTROL KIT (OPTIONAL)

The optional remote control kit consists of a switch box, remote control cable, and relay box. The relay box is installed in the generator's control box, and is connected in parallel to the wires between the engine switch and the engine. The control cable connects the relay box to the remote switch box, which has an engine toggle switch, starter button, and pilot lamp.

DISASSEMBLY/ASSEMBLY

• INDEXES AND MARKINGS



WARNINGS

- Do not operate unit in shop unless it is well ventilated. Do not smoke or allow open flames or sparks near unit when servicing.
- To avoid personal injury, be sure to stop the engine, and make sure that engine is not high temperature whenever servicing.
- As with any source of electricity, the generator is a potential source of electric shock when misused. Exercise care to avoid shocks, especially when inspecting the unit when it is running.

FASTENED PARTS

ENGINE UNIT
GENERATOR UNIT
DRIVEN PULLEY
CYLINDER HEAD
STANDARD TORQUE

FASTENERS

10mm bolt, nut
10mm bolt, nut
18mm nut
10mm special bolt
5mm bolt, nut
6mm bolt, nut
8mm bolt, nut

TIGHTENING TORQUE

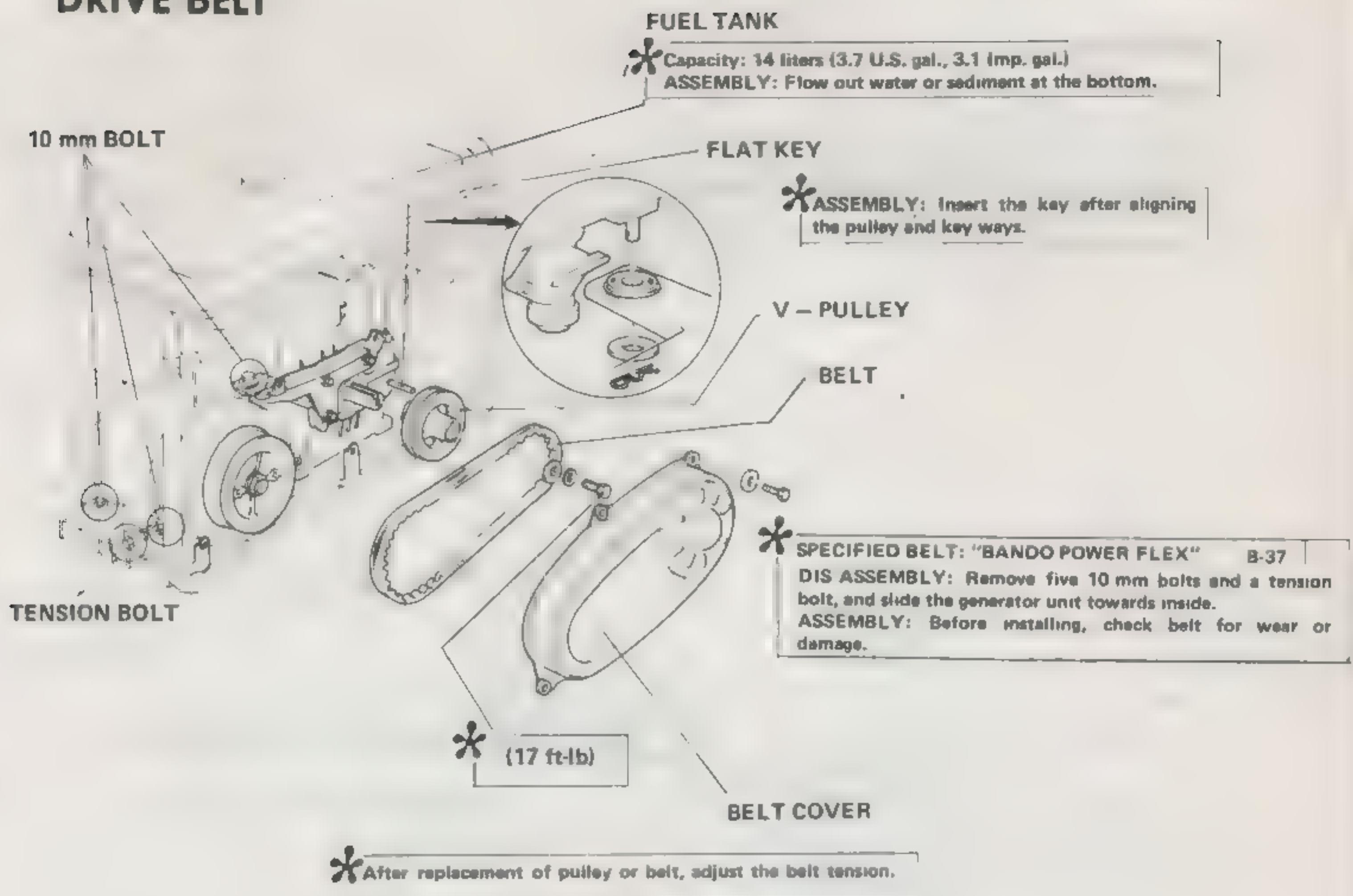
4.0 – 5.0 kg-m (28.9 – 36.2 lbs-ft)
4.0 – 5.0 kg-m (28.9 – 36.2 lbs-ft)
8.0 – 8.0 kg-m (43.4 – 57.9 lbs-ft)
3.5 – 4.0 kg-m (25.3 – 28.9 lbs-ft)
0.4 – 0.7 kg-m (2.9 – 5.1 lbs-ft)
0.8 – 1.2 kg-m (5.8 – 8.7 lbs-ft)
2.0 – 2.8 kg-m (14.5 – 20.2 lbs-ft)

- WIRE COLOR CODE (The color of wires indicated by the code below in the text are as follows:)

B	Black
Bl	Blue
Br	Brown
Gr	Green
Gr/W	Green/White
Lg	Light Green

Lg/B	Light Green/Black
Lg/R	Light Green/Red
Lg/W	Light Green/White
R	Red
R/B	Red/Black
R/W	Red/white
Y/B	Yellow/Black

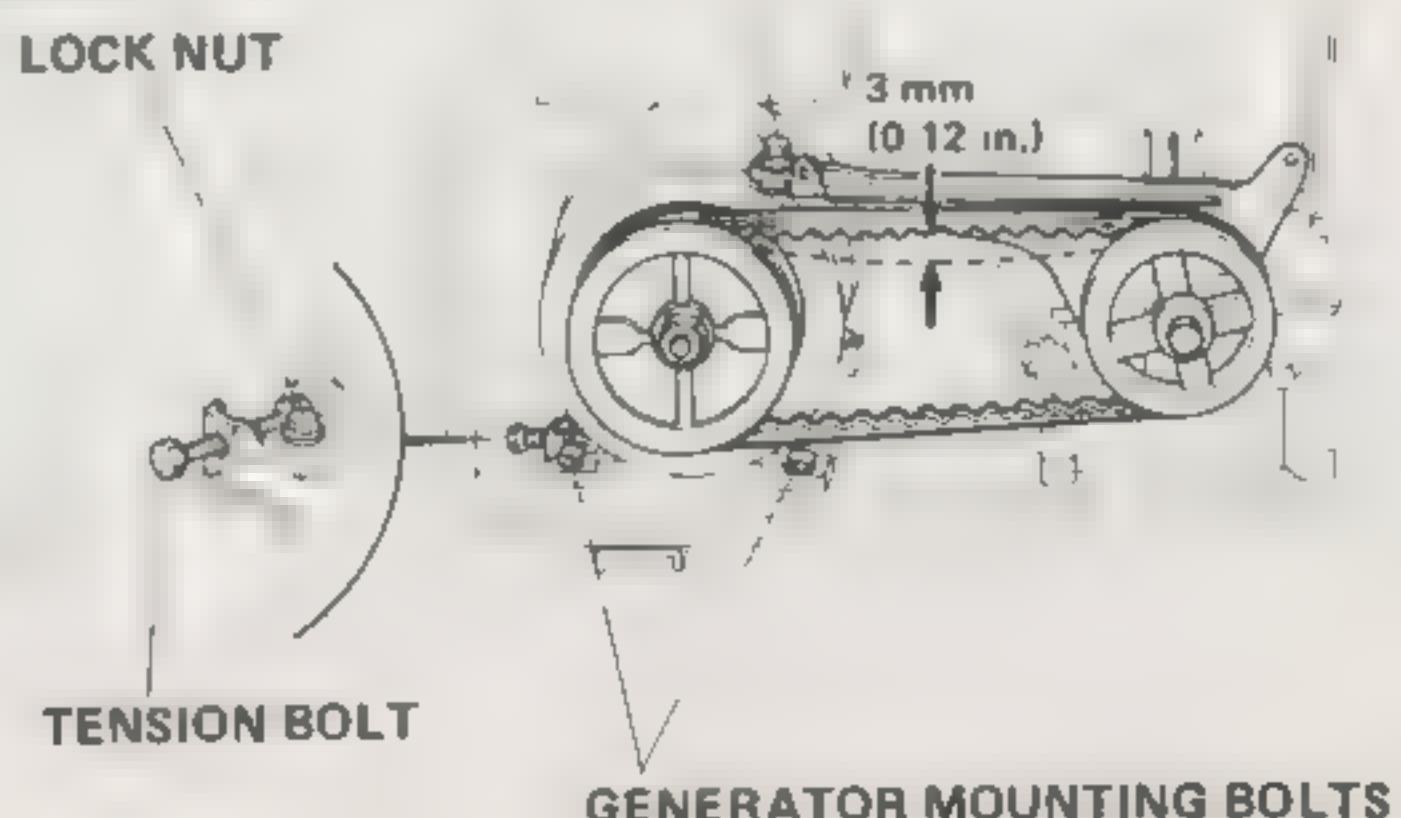
DRIVE BELT



•BELT TENSION ADJUSTMENT

1. Check that belt play is 3mm (1/8 in) at the middle.
2. If the belt tension is improper, loosen four generator mounting bolts, stay tightening bolt and tension lock nut. Then turn the adjusting bolt until the proper belt tension is obtained.
3. After adjusting, be sure to tighten the lock nut securely. (See tightening torque table on page 73)

STAY TIGHTENING BOLT

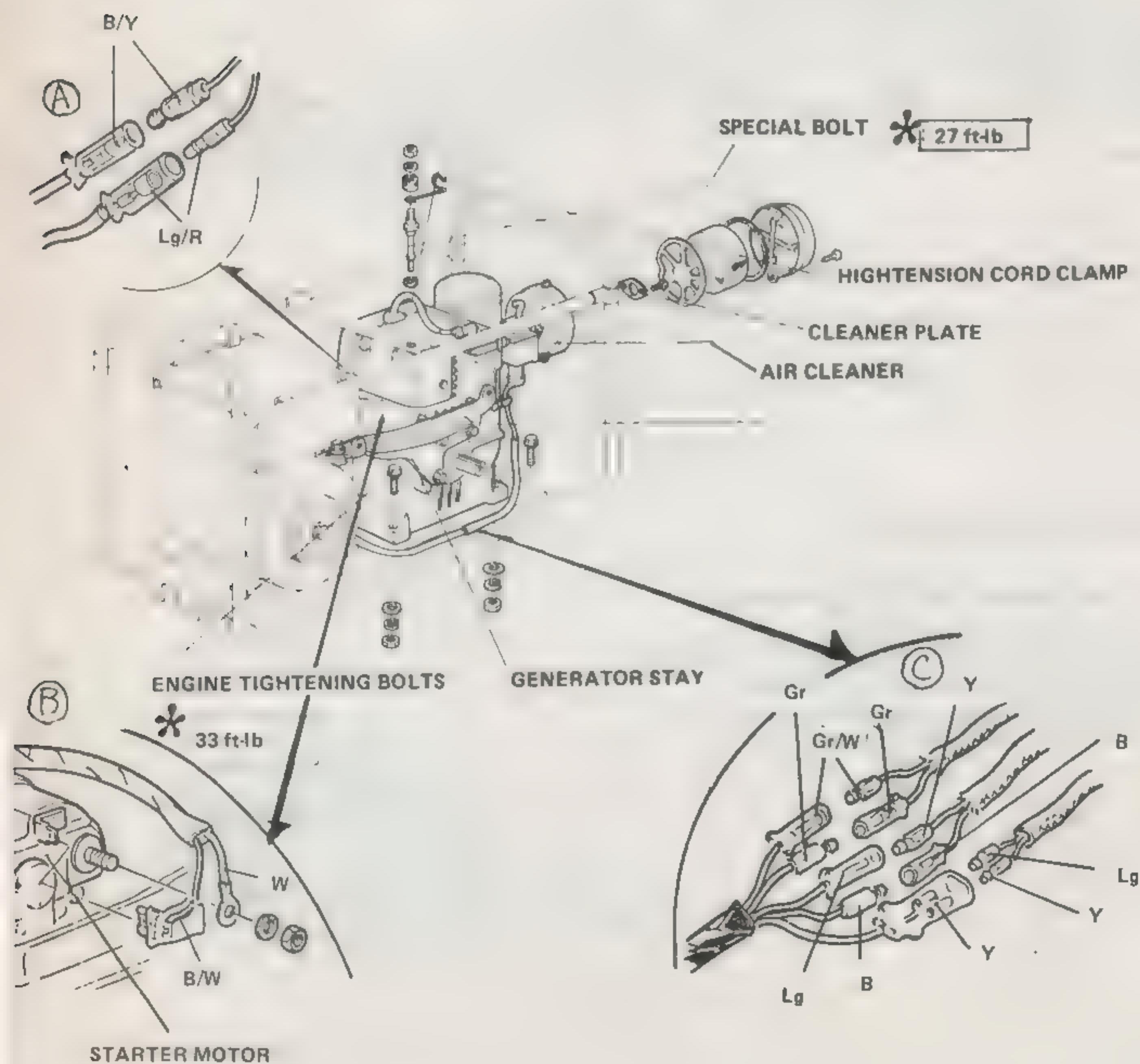


ENGINE REMOVAL

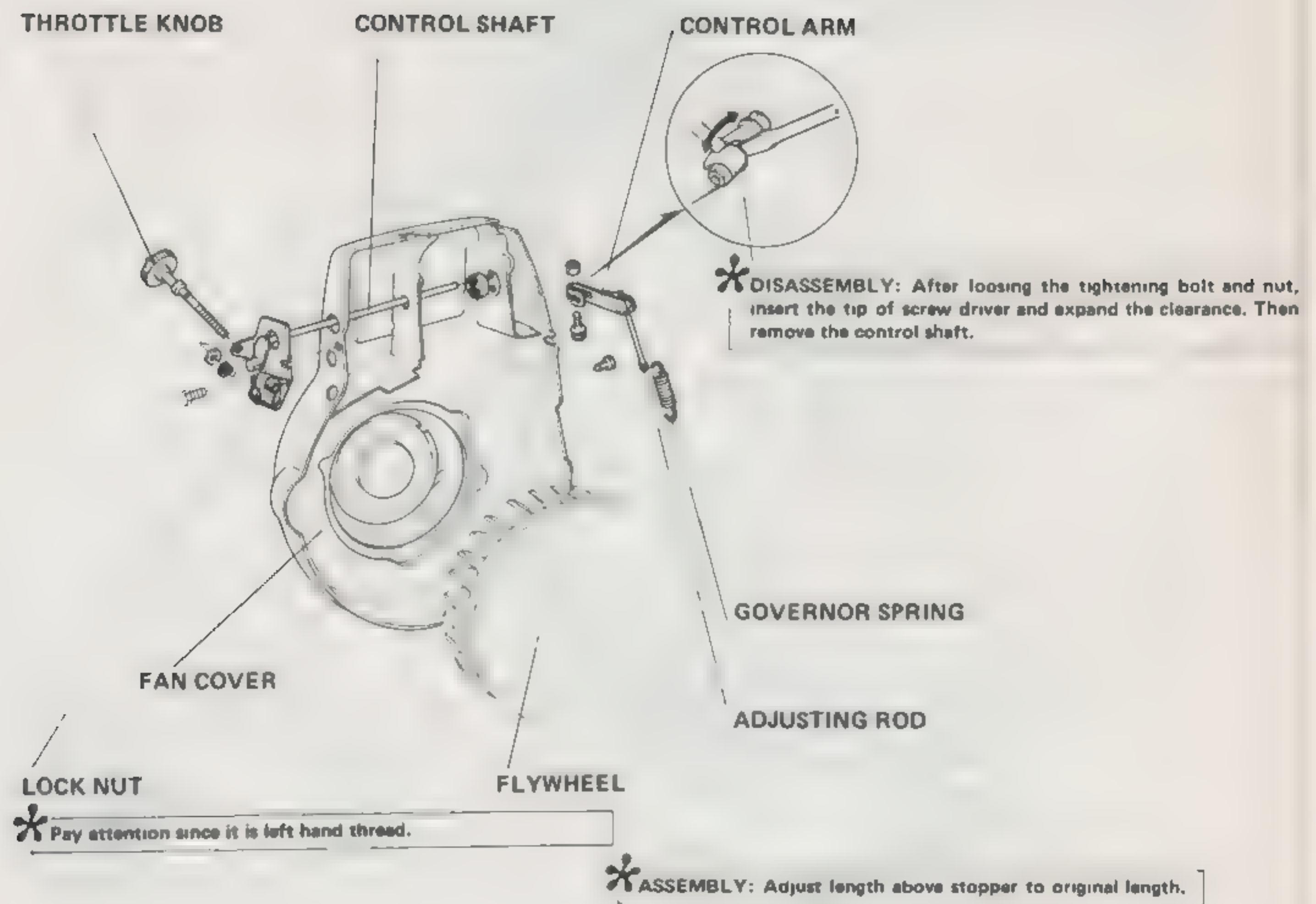


Remove these parts before you remove the engine.

1. Tank, belt cover, and belt (pg).
2. Drive pulley and generator stay.
3. Engine mounting bolts.
4. High tension cord clamp and special bolt.
5. Disconnect A connector (Engine switch/Charging coil).
6. Disconnect B connector (Starter)..
7. Disconnect C connector (Fuel cut-off/Choke solenoid).



THROTTLE KNOB



FUEL CUT-OFF SOLENOID

WARNING

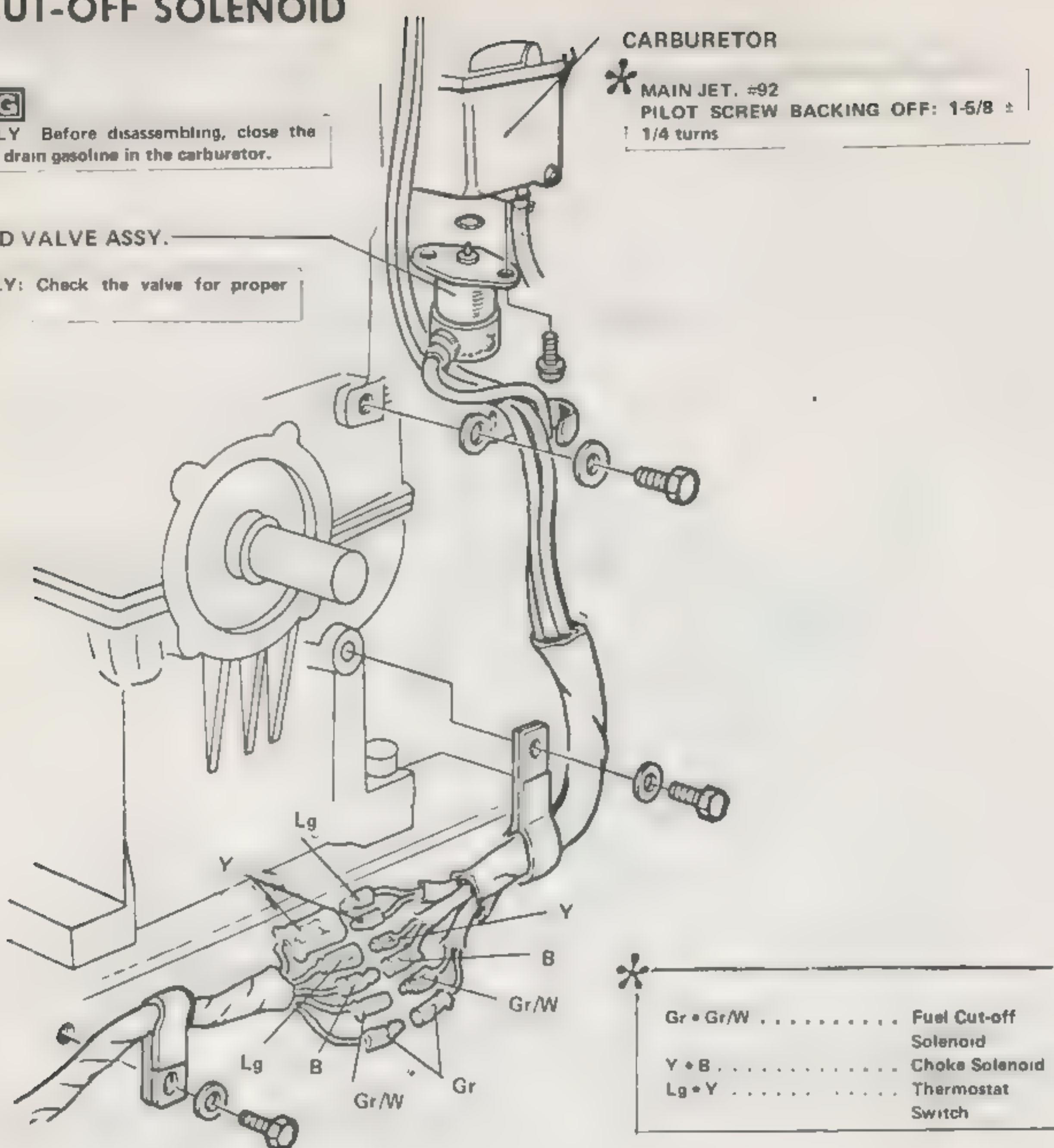
DISASSEMBLY Before disassembling, close the fuel cock and drain gasoline in the carburetor.

CARBURETOR

* MAIN JET. #92
PILOT SCREW BACKING OFF: 1-5/8 ±
1 1/4 turns

SOLENOID VALVE ASSY.

* ASSEMBLY: Check the valve for proper operation.



b. INSPECTION

• FUEL CUT SOLENOID

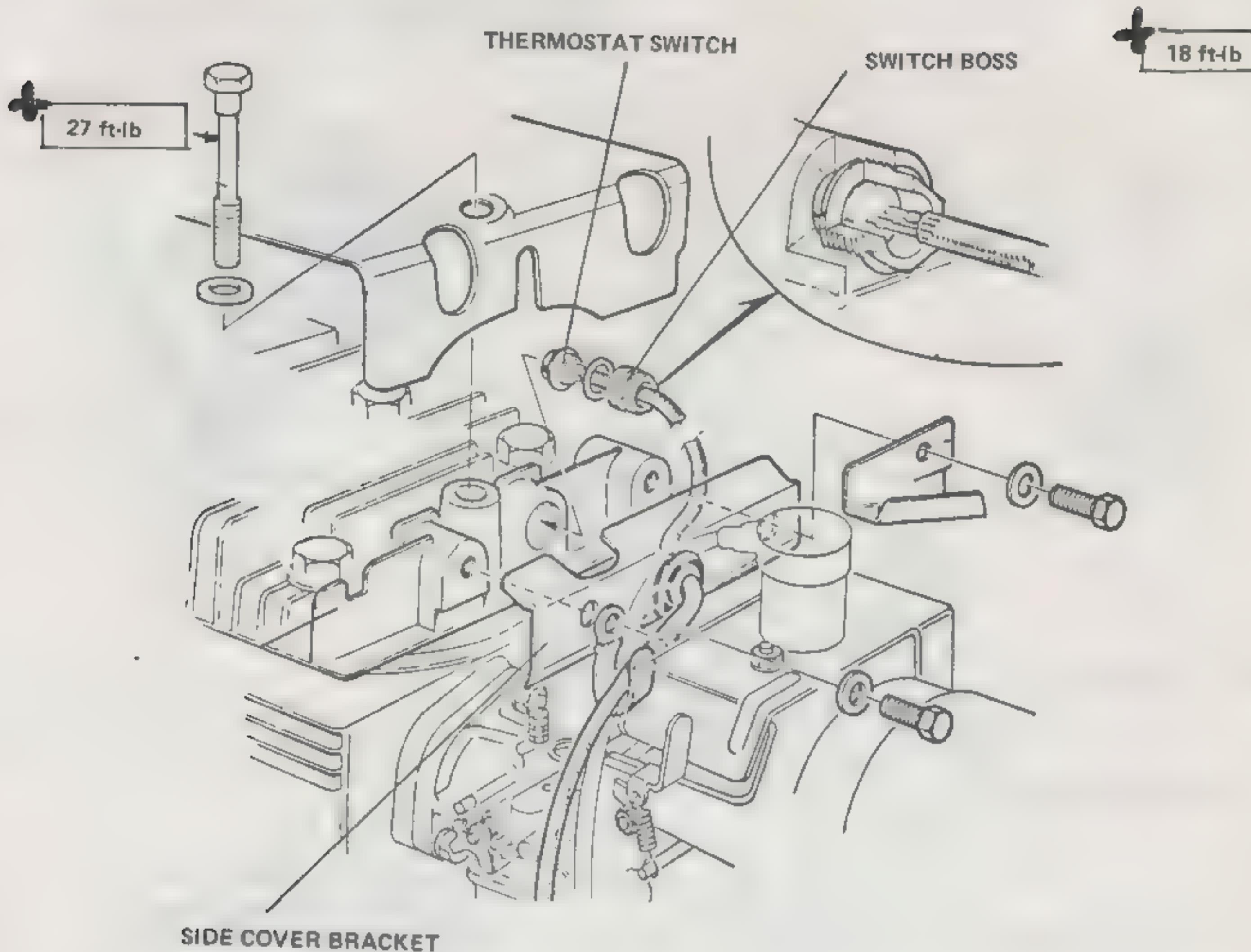
RESISTANCE VALUE: 6.7–8.7Ω



If the specified resistance can not be obtained, replace the solenoid valve with new one.

Gr/W Gr

THERMOSTAT SWITCH



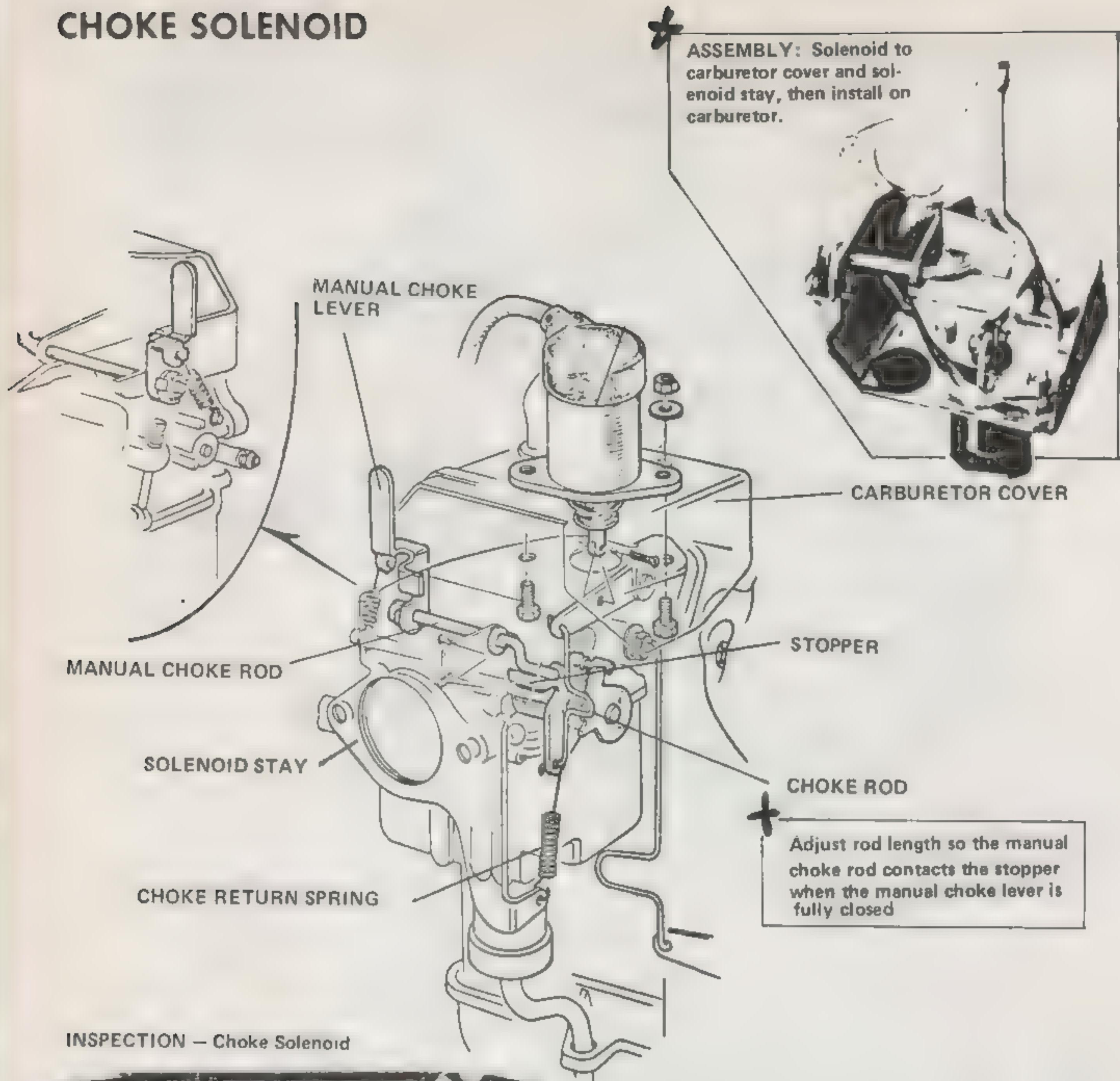
INSPECTION – Thermostat Switch



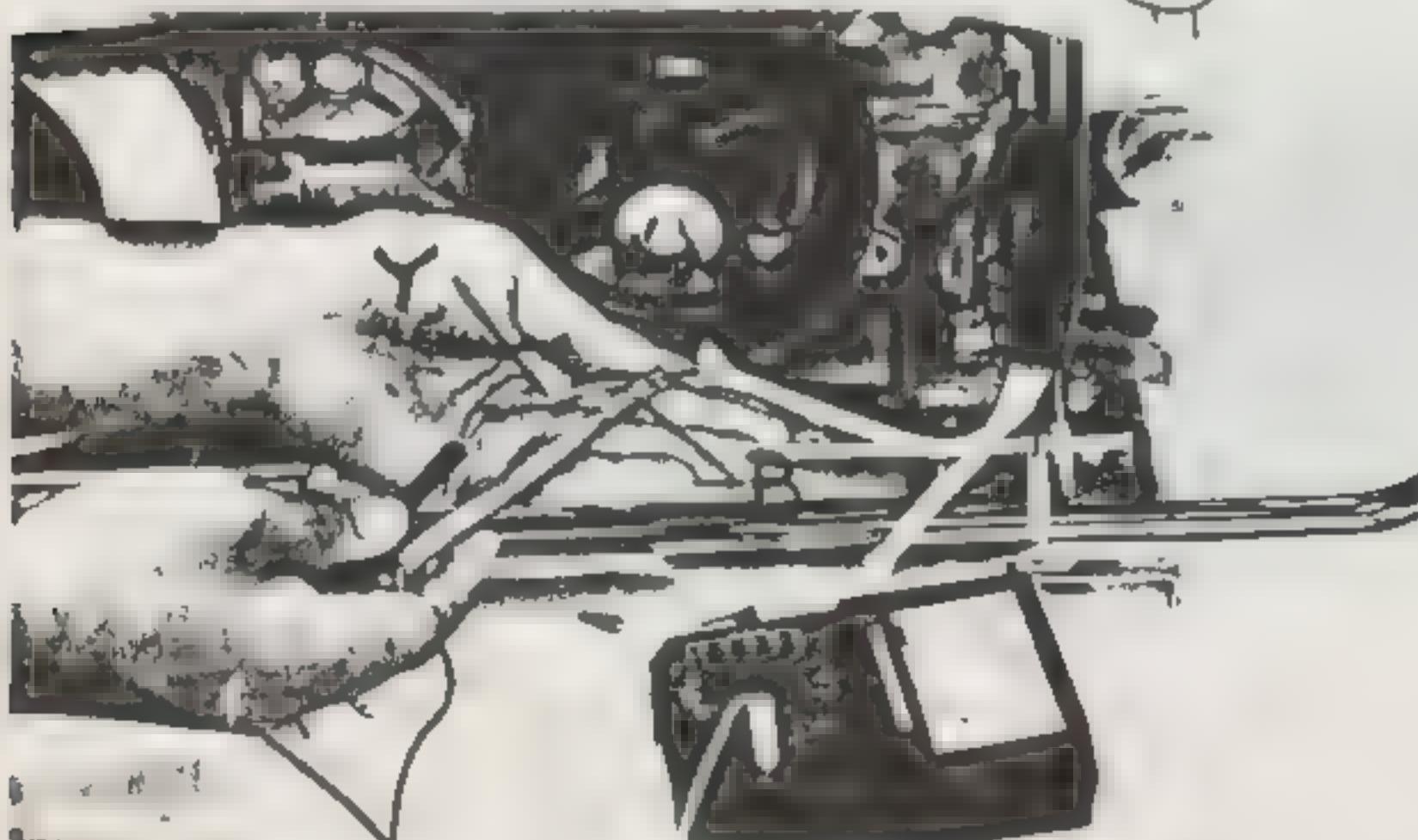
* Check continuity between Lg and Y leads when the thermostat switch is in water at the specified temperature.

WATER TEMP	CONTINUITY
Above 34° C (93° F)	YES
Below 18° C (64° F)	NO

CHOKE SOLENOID

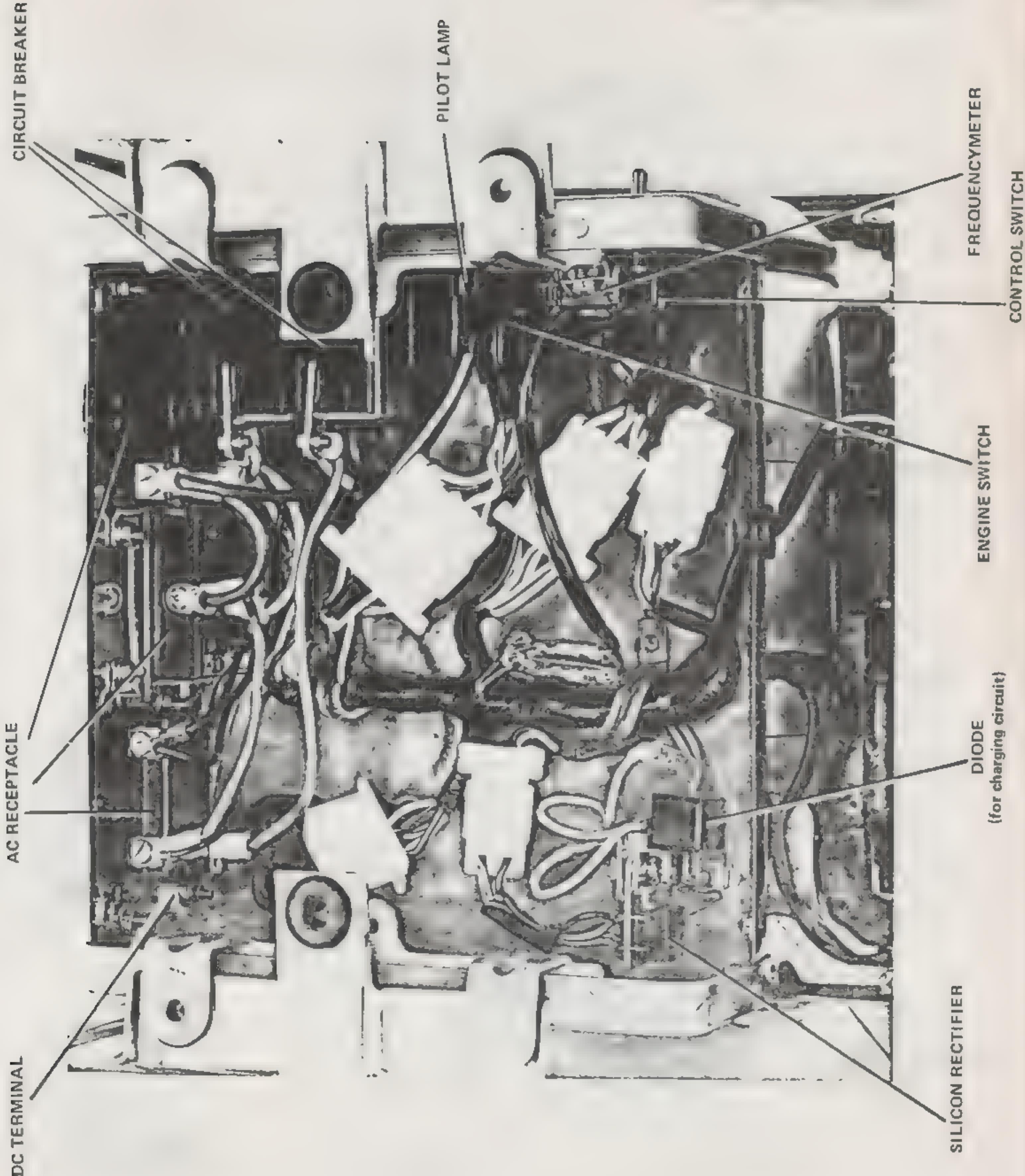


INSPECTION – Choke Solenoid



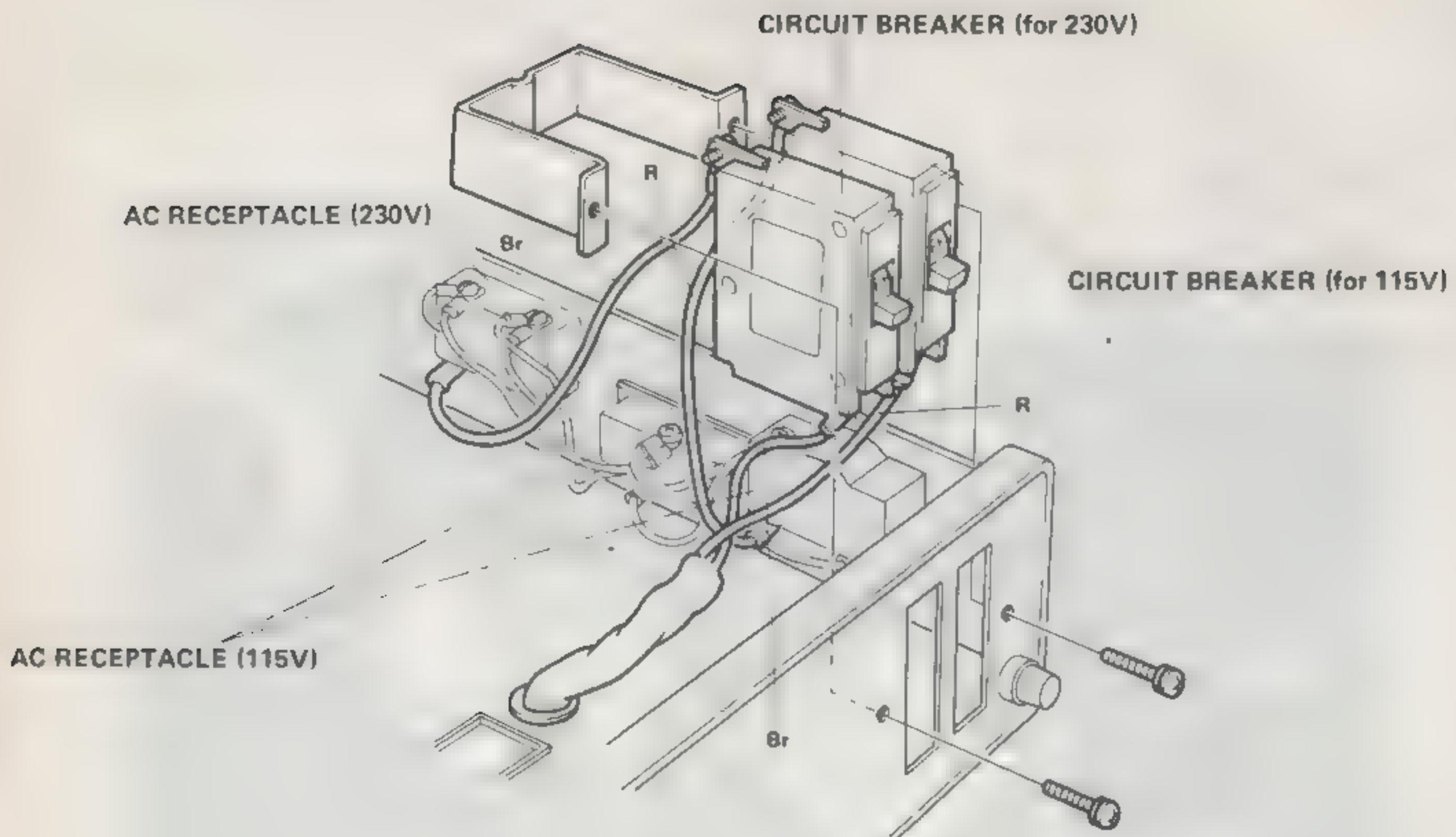
RESISTANCE: 7-10Ω

CONTROL BOX

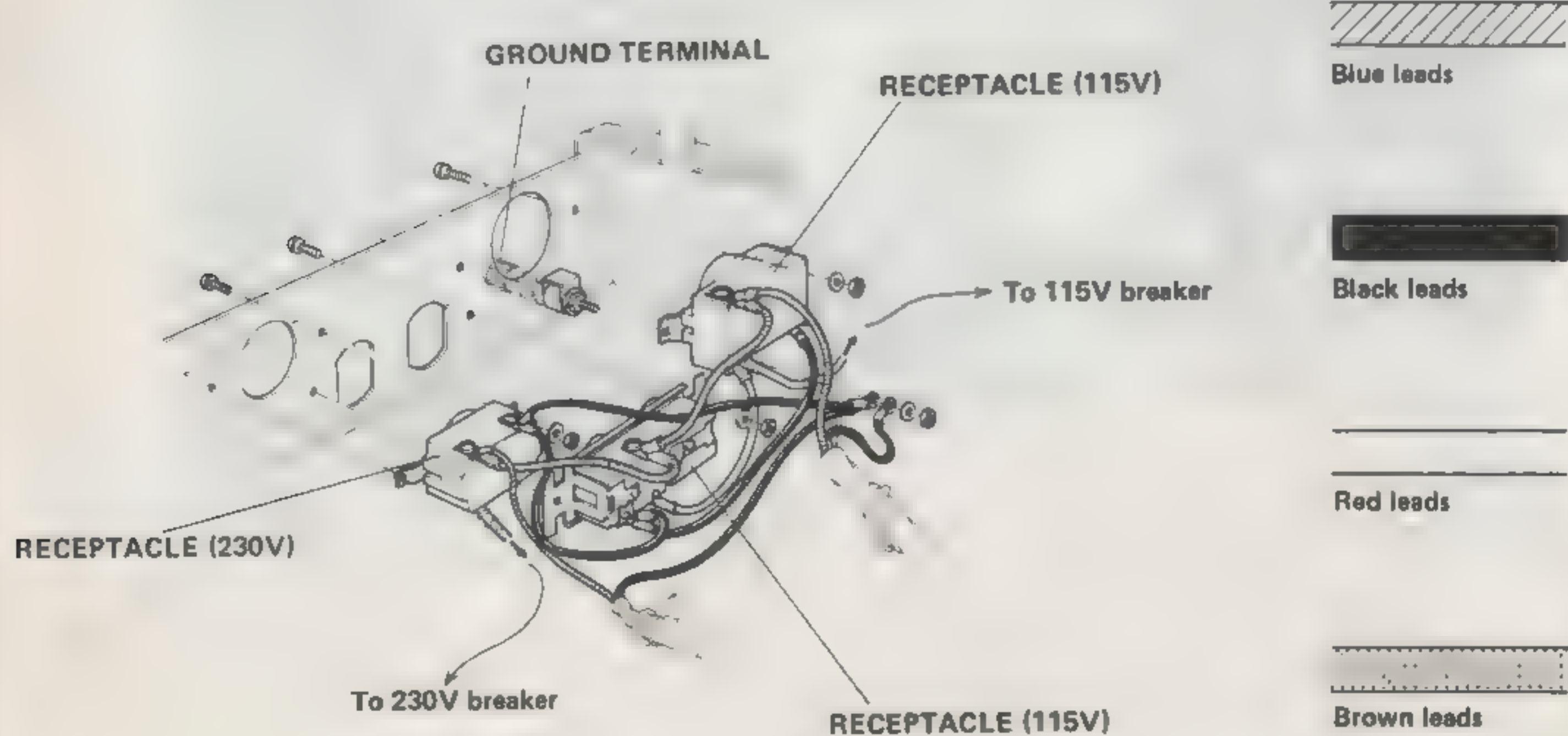


ASSEMBLY

CONTROL BOX

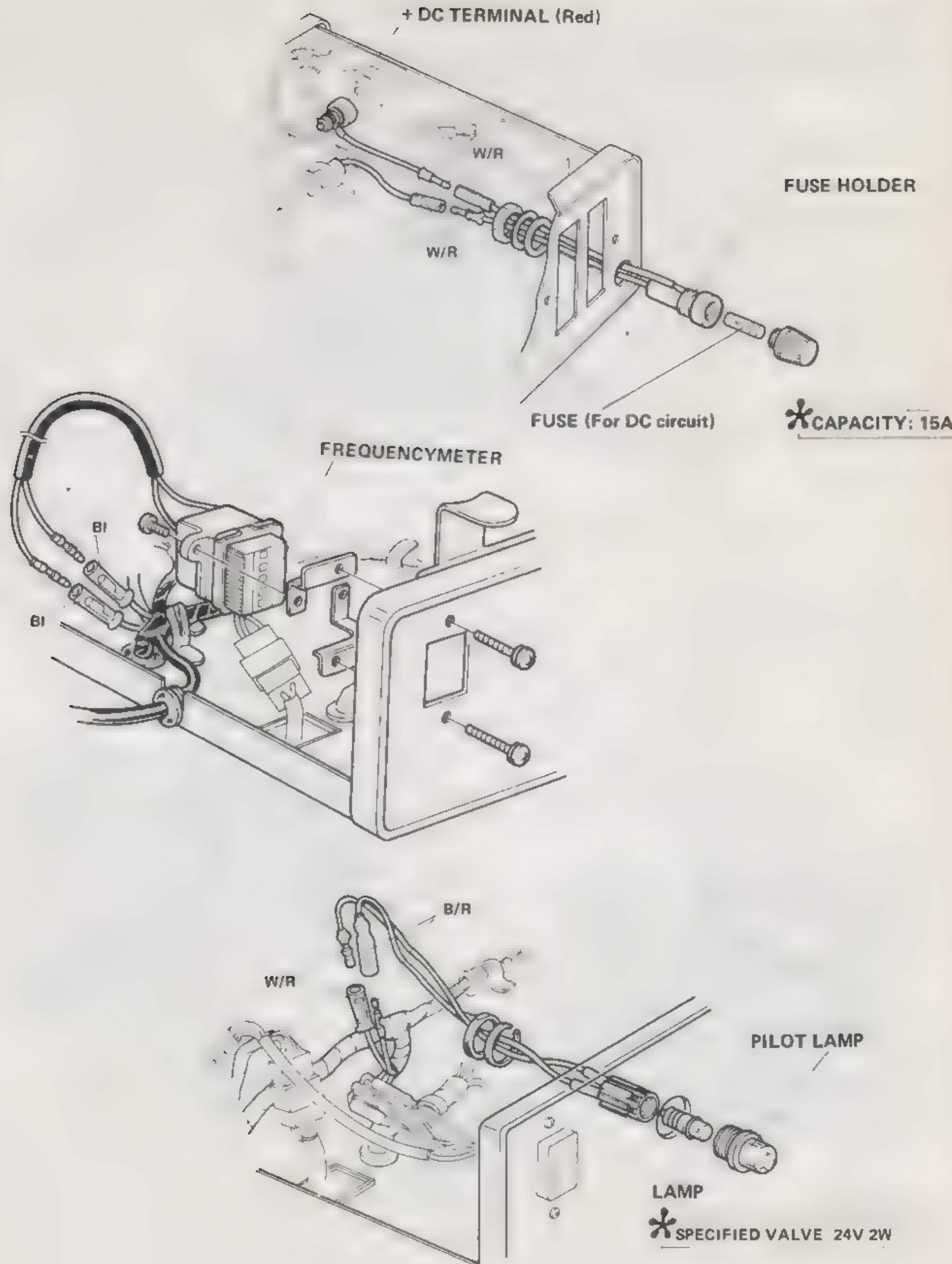


•AC RECEPTACLES

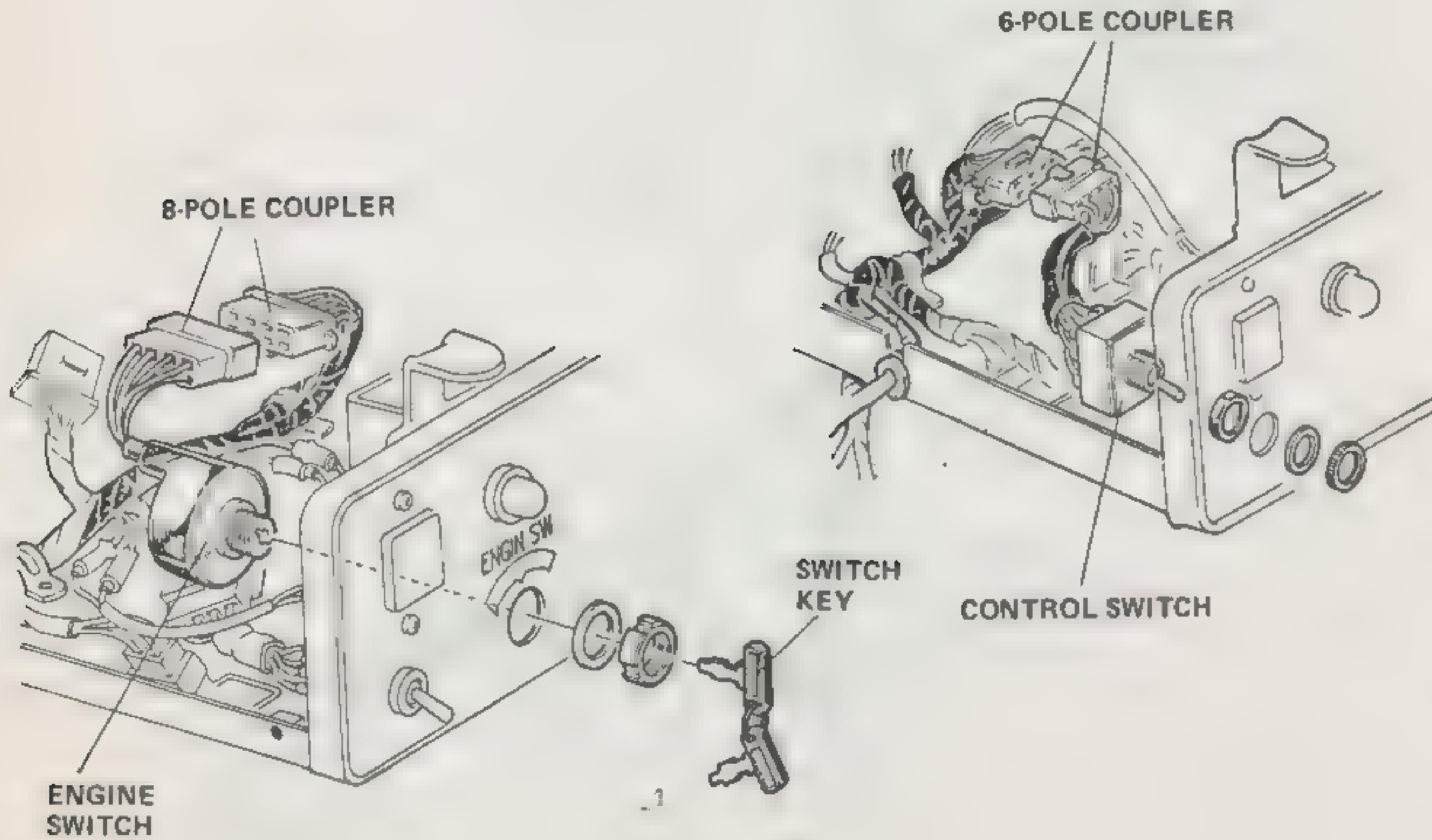
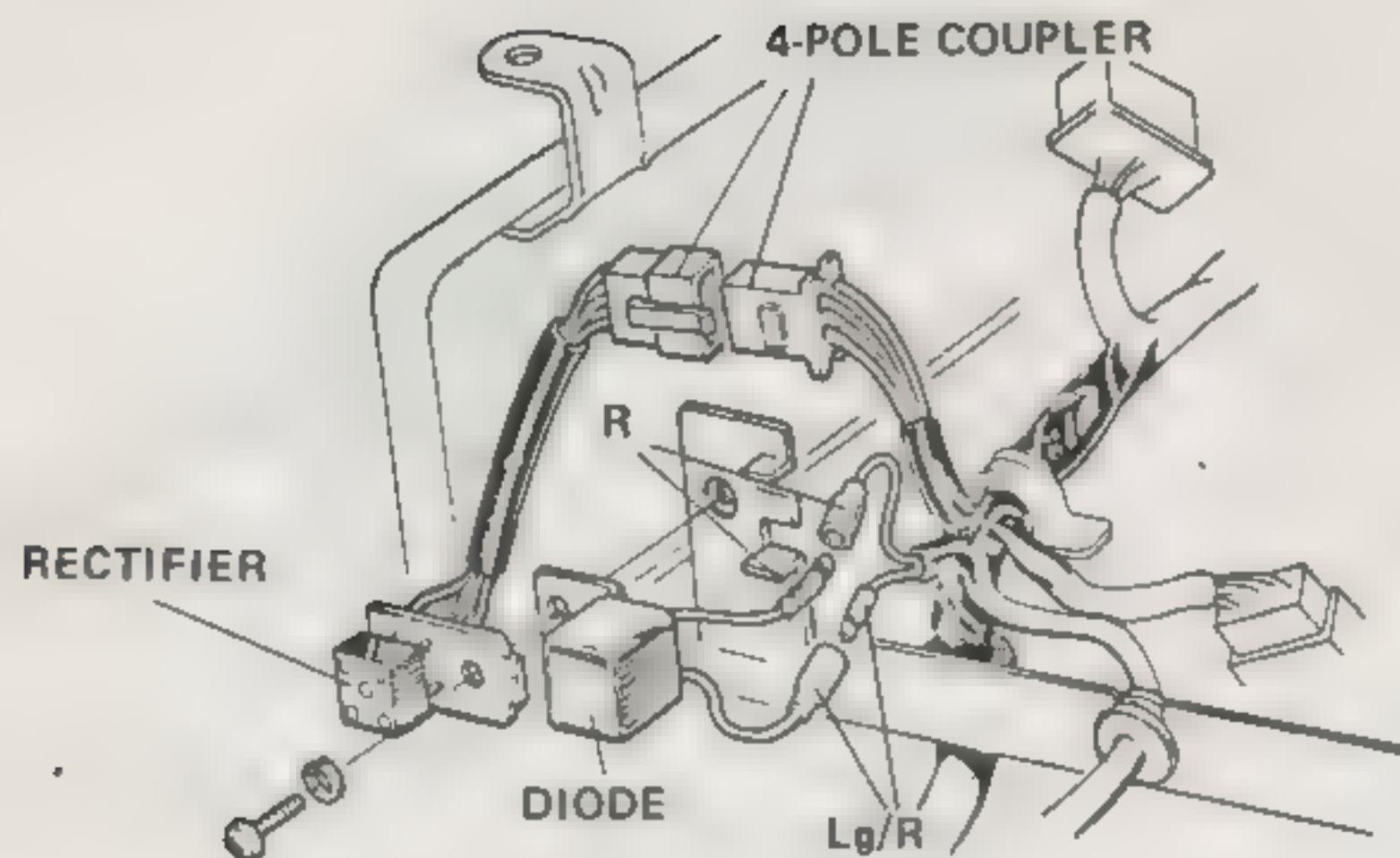


ASSEMBLY

CONTROL BOX



ASSEMBLY
CONTROL BOX

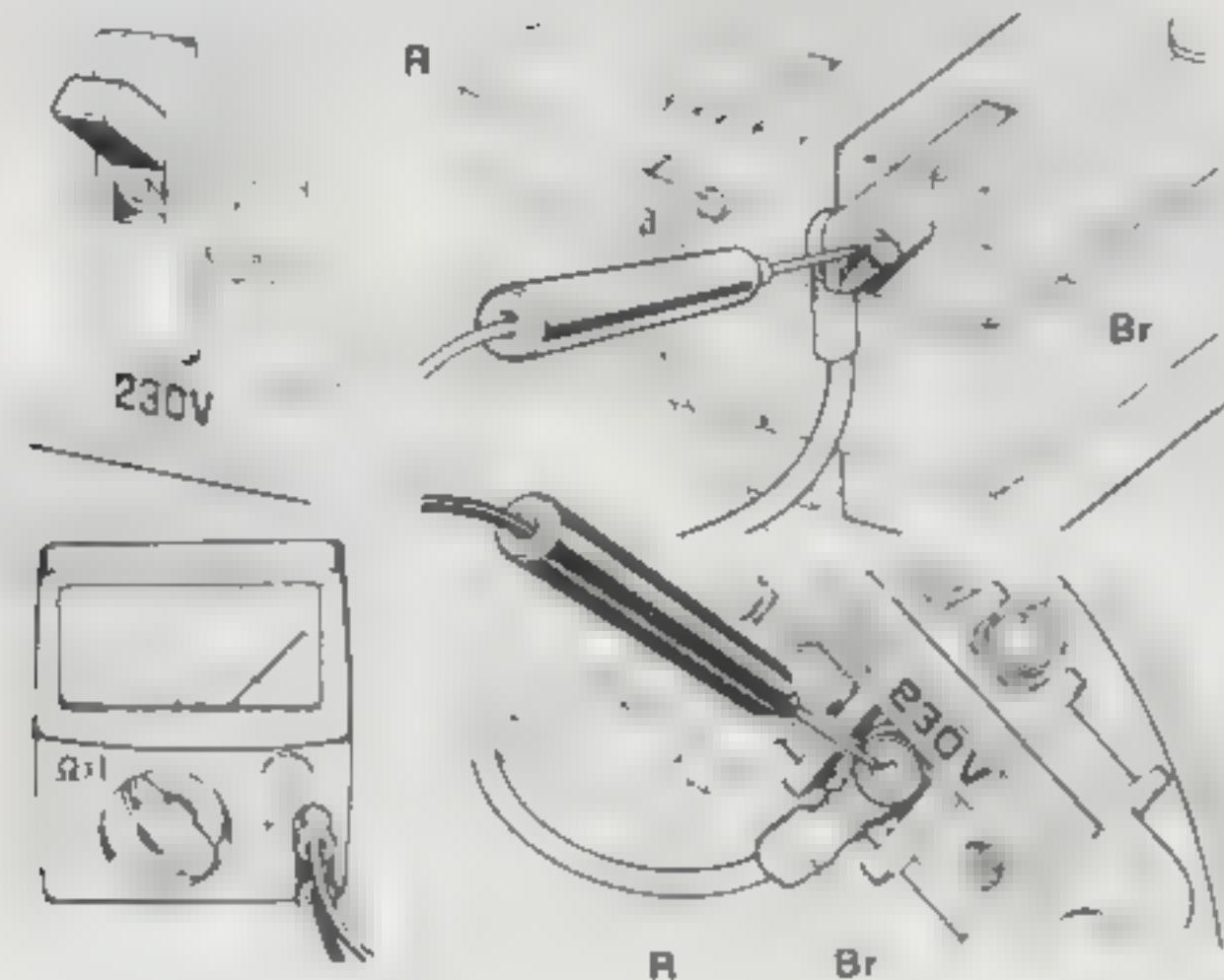


INSPECTION

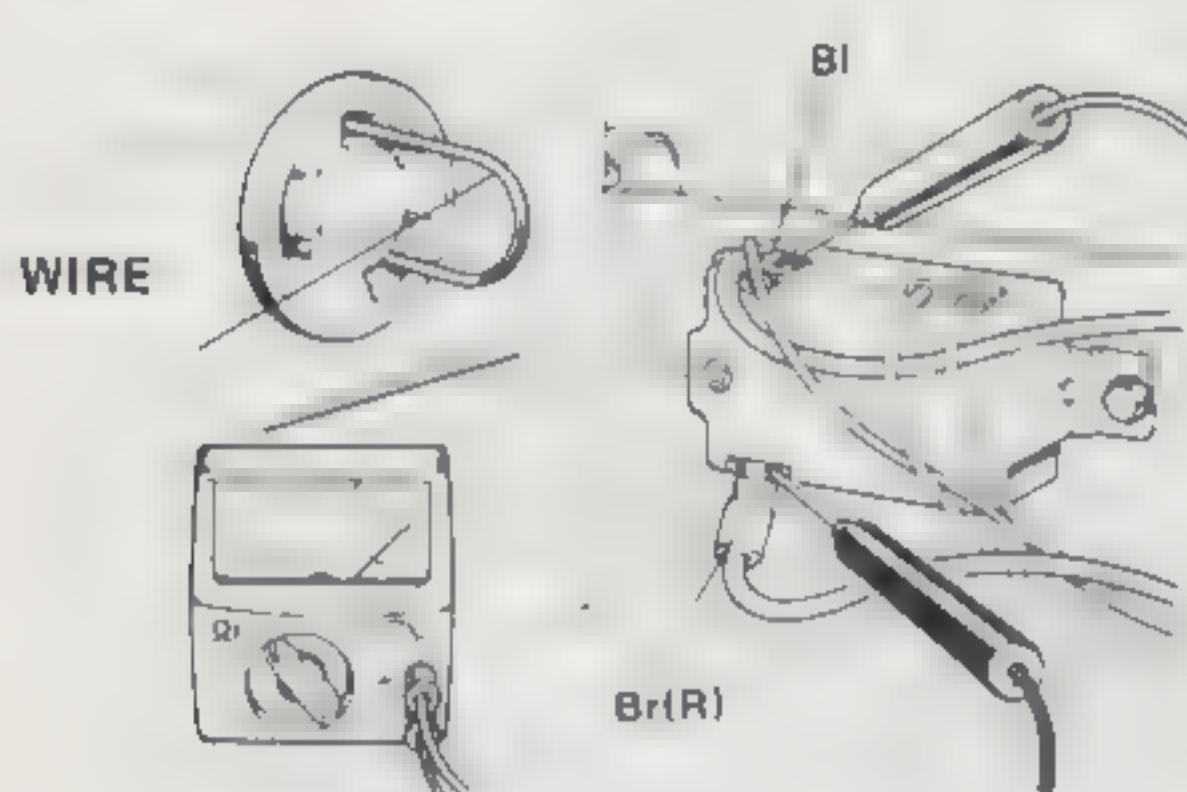
CONTROL BOX

•CIRCUIT BREAKER

- * • The main inspection herein is a continuity test. With ohmmeter, check continuity between wires shown in illustrations or photos.
• If no continuity exists, replace with new one.



•AC RECEPTACLES

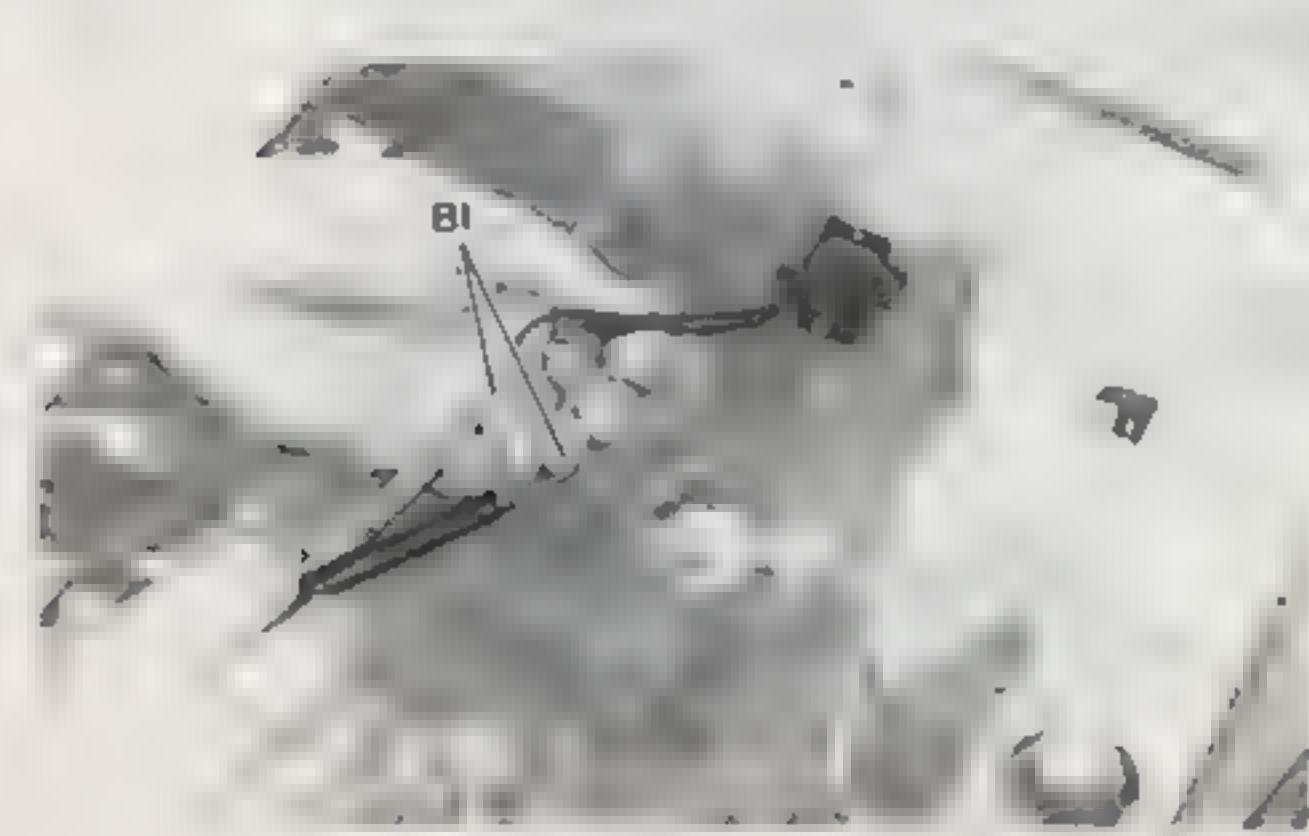


- * Check continuity with circuit breaker OFF and AC terminal shorted with a piece of wire as shown.

•FREQUENCYMETER

- * Disconnect blue wire and measure the resistance. If out of specification, replace

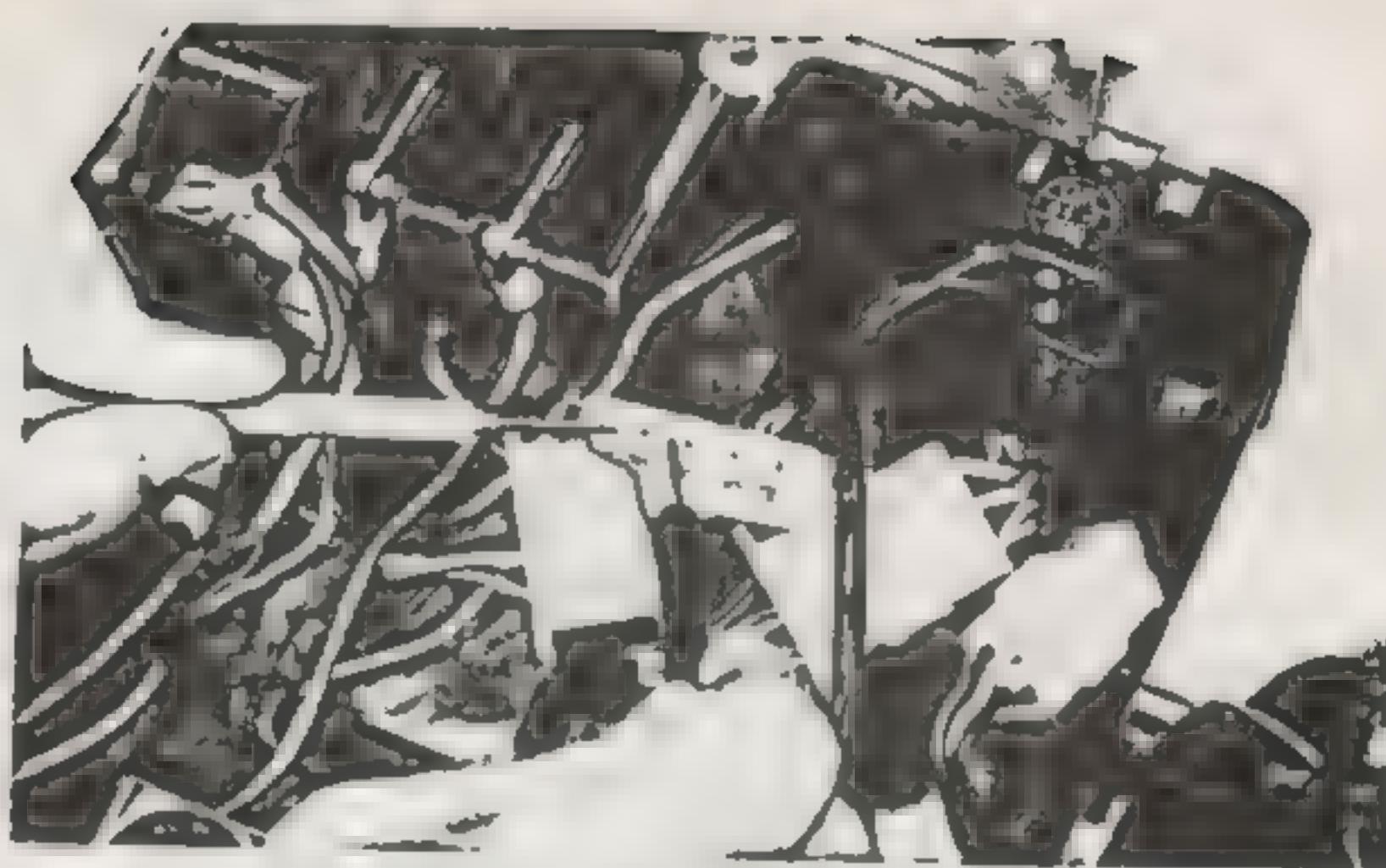
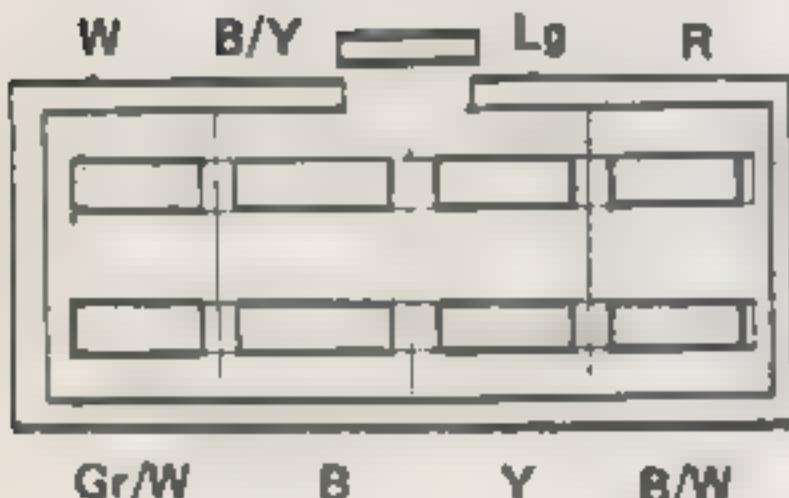
RESISTANCE VALUE: 72Ω



CONTROL BOX

• ENGINE SWITCH

Check continuity between the leads shown with the * mark below, setting the engine switch to "OFF", "ON", or "START".



	CODE LEADS	IG	E	BT	ST	AS	S	G	FS
E-SW	B/Y	B	W	B/W	Lg	Y	R	Gr/W	
OFF		●	●					●	●
ON				●	●				
START				●	●	●	●		

CODE:

E ... EARTH

BT ... BATTERY

ST ... STARTER

AS ... AUTO-CHOKE SOLENOID

G ... GENERATOR

S RESTART CIRCUIT

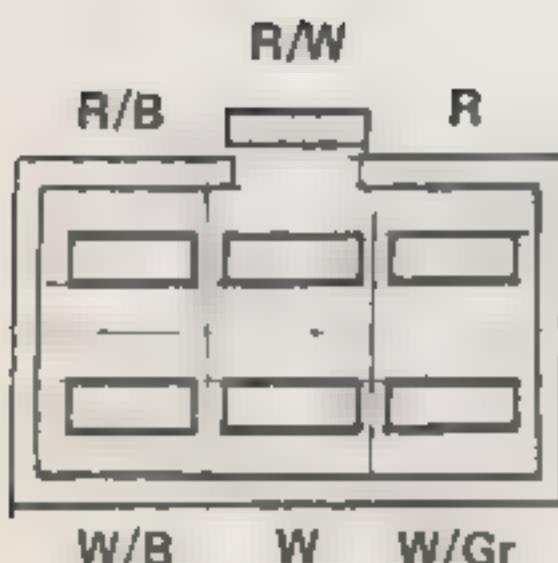
IG ... IGNITION

FS ... FUEL CUT-OFF SOLENOID

• CONTROL SWITCH

Check continuity as above, setting the control switch to "ON" or "OFF".

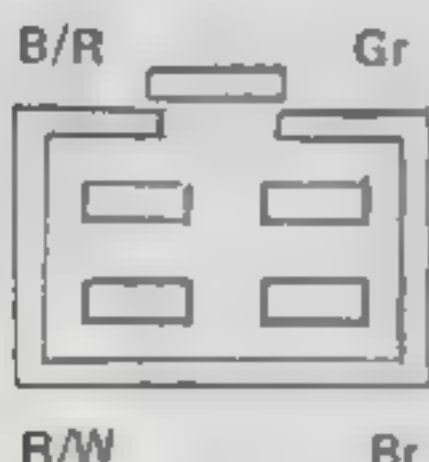
	LEADS	R	R/W	R/B	W/Gr	W	W/B
C-SW	C-SW						
OFF		●	●		●	●	
ON			●	●		●	●



INSPECTION

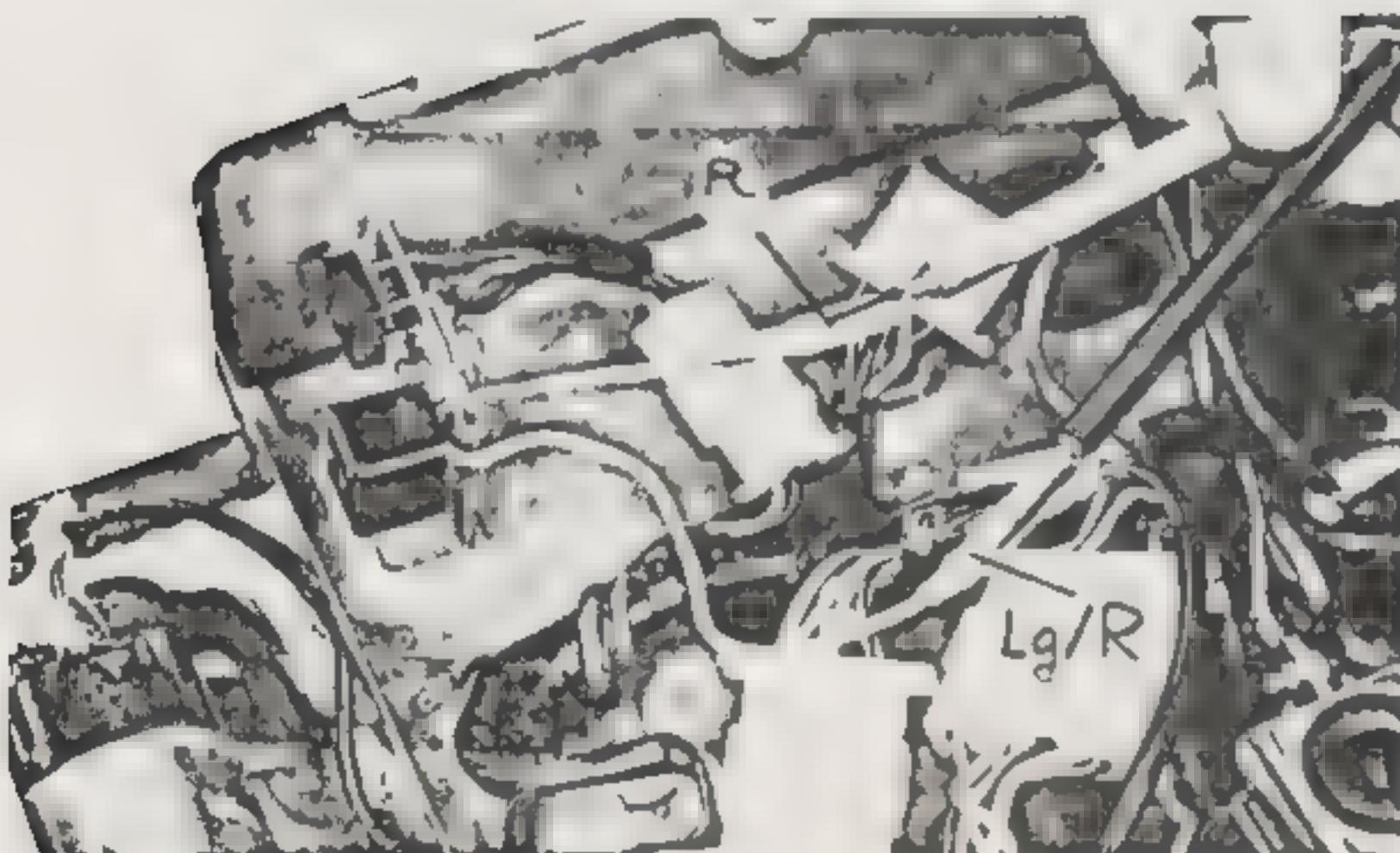
CONTROL BOX

- SILICON RECTIFIER
(For FUEL-CUT SOLENOID)



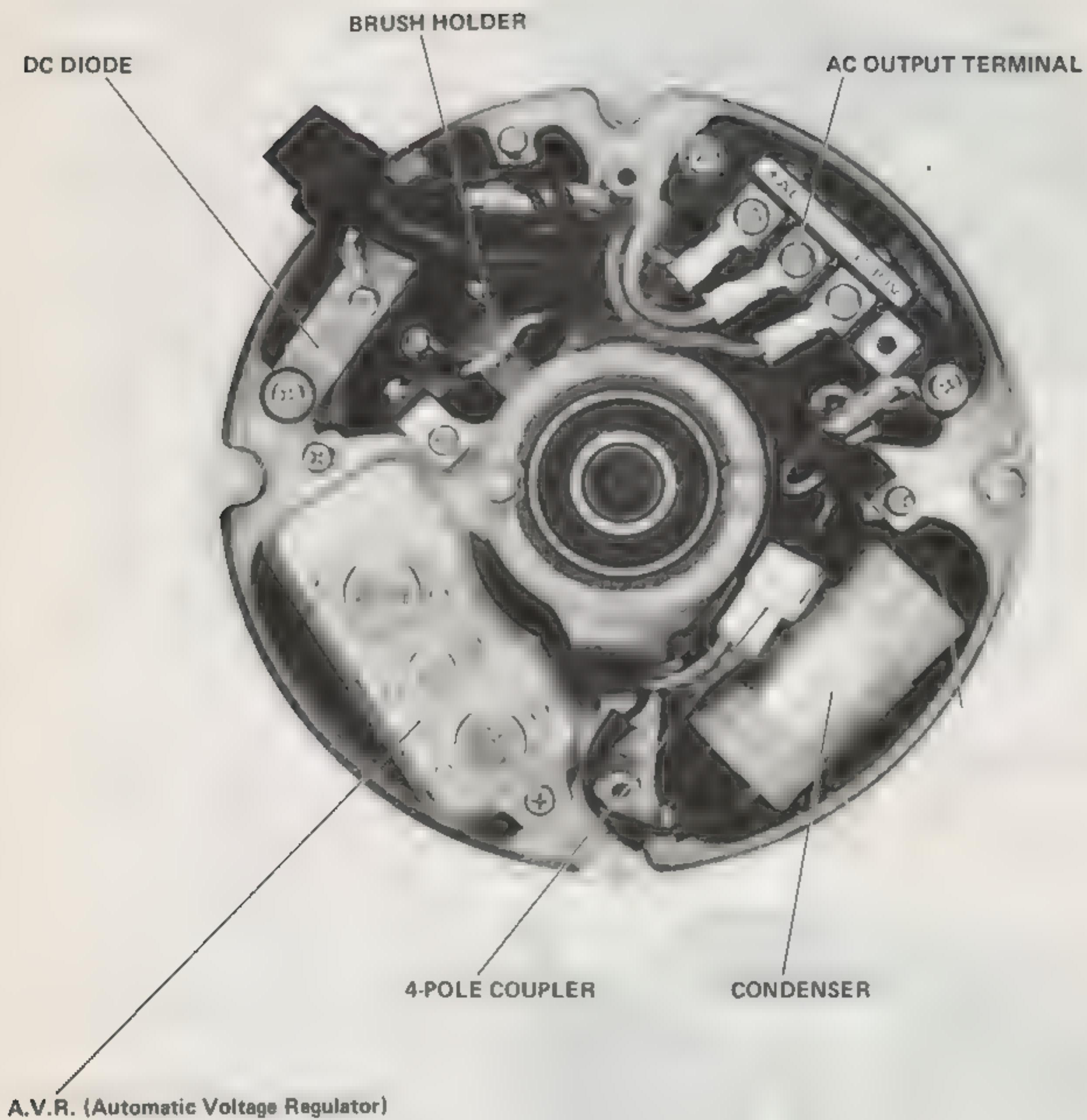
POLARITY OF TESTER		CONTINUITY
(+)	(-)	
Gr	B/R	NO
B/R	Gr	YES
B/R	R/W	NO
R/W	B/R	YES
Gr	Br	NO
Br	Gr	YES
Br	R/W	NO
R/W	Br	YES

- DIODE (FOR CHARGING CIRCUIT)



POLARITY OF TESTER		CONTINUITY
(+)	(-)	
Lg/R	R	NO
R	Lg/R	YES

GENERATOR



ASSEMBLY

GENERATOR

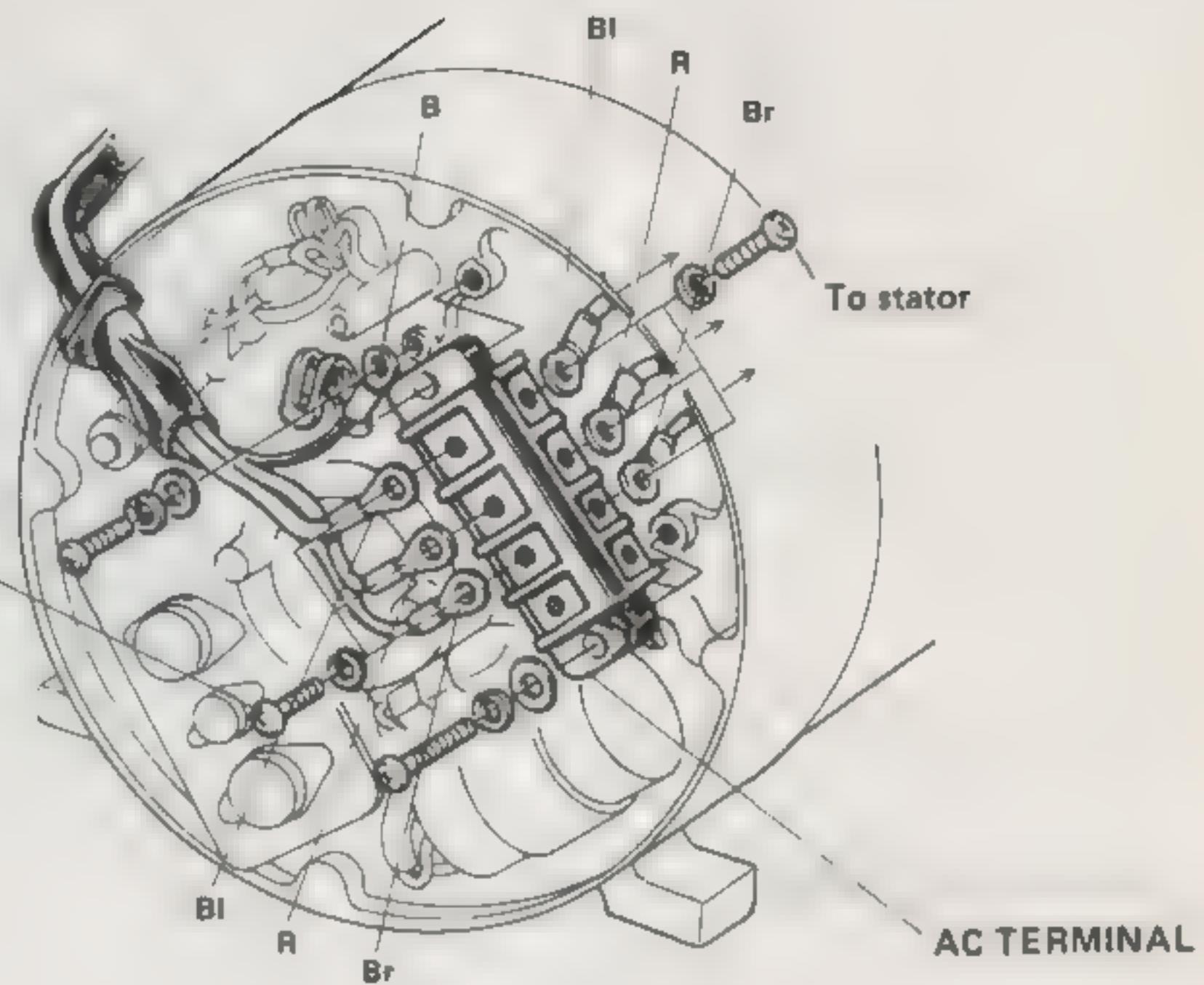
•AC OUTPUT TERMINAL

[WARNING]

If a lead securing screw is not tighten securely, a heat may be generated.

LEAD SECURING SCREW

ASSEMBLY: Tighten securely.



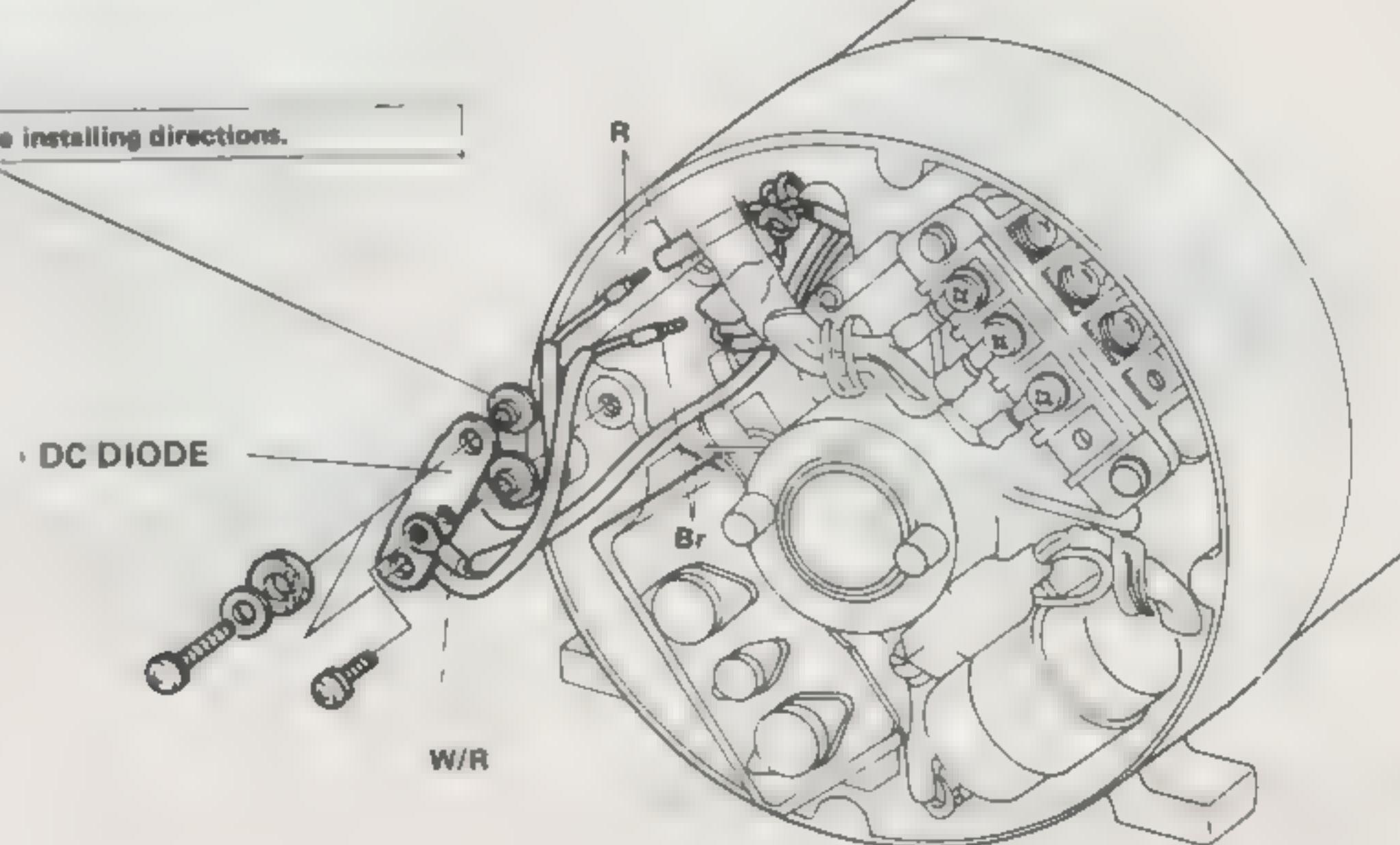
•DC DIODE

INSULATING BUSHING

ASSEMBLY: Note the installing directions.

DC DIODE

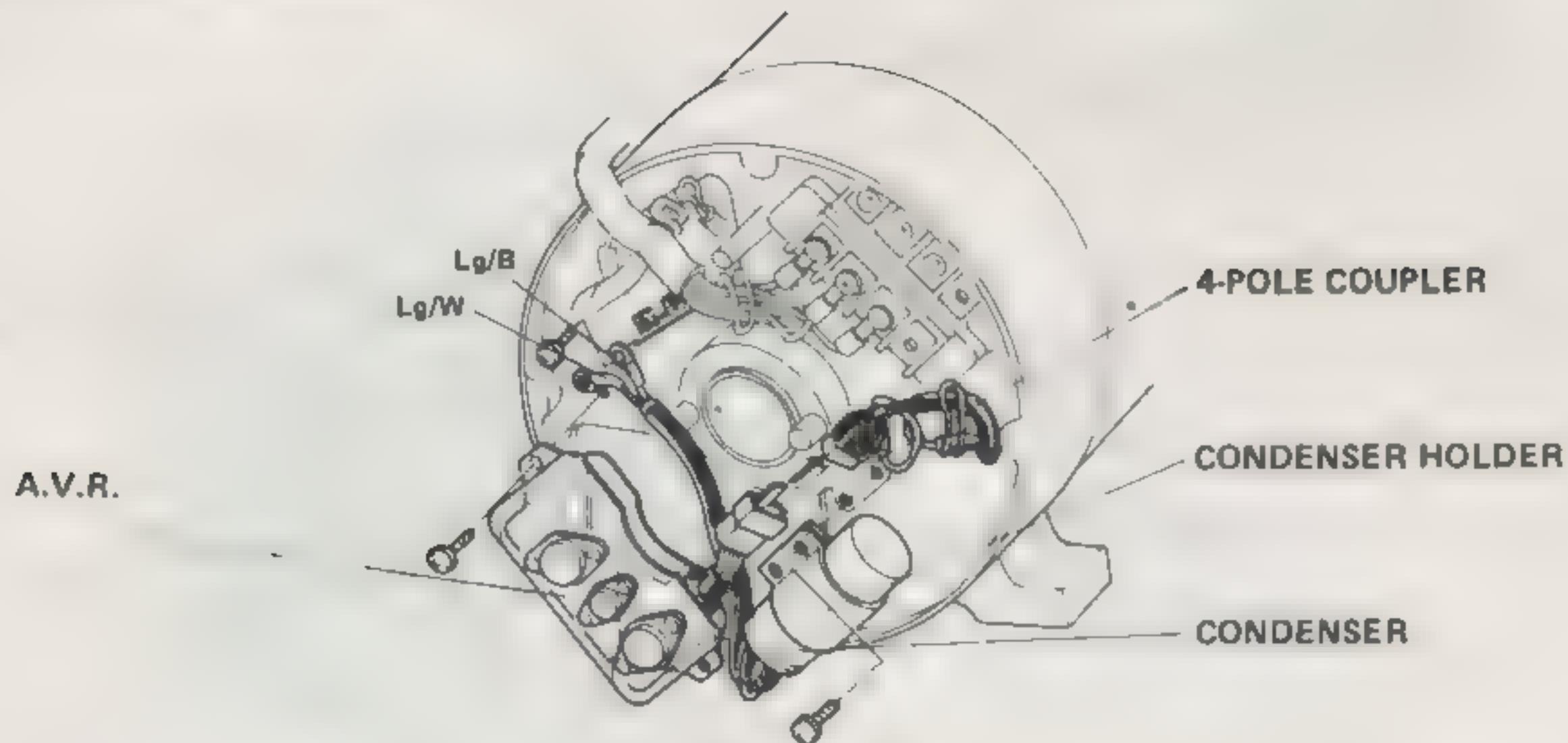
W/R



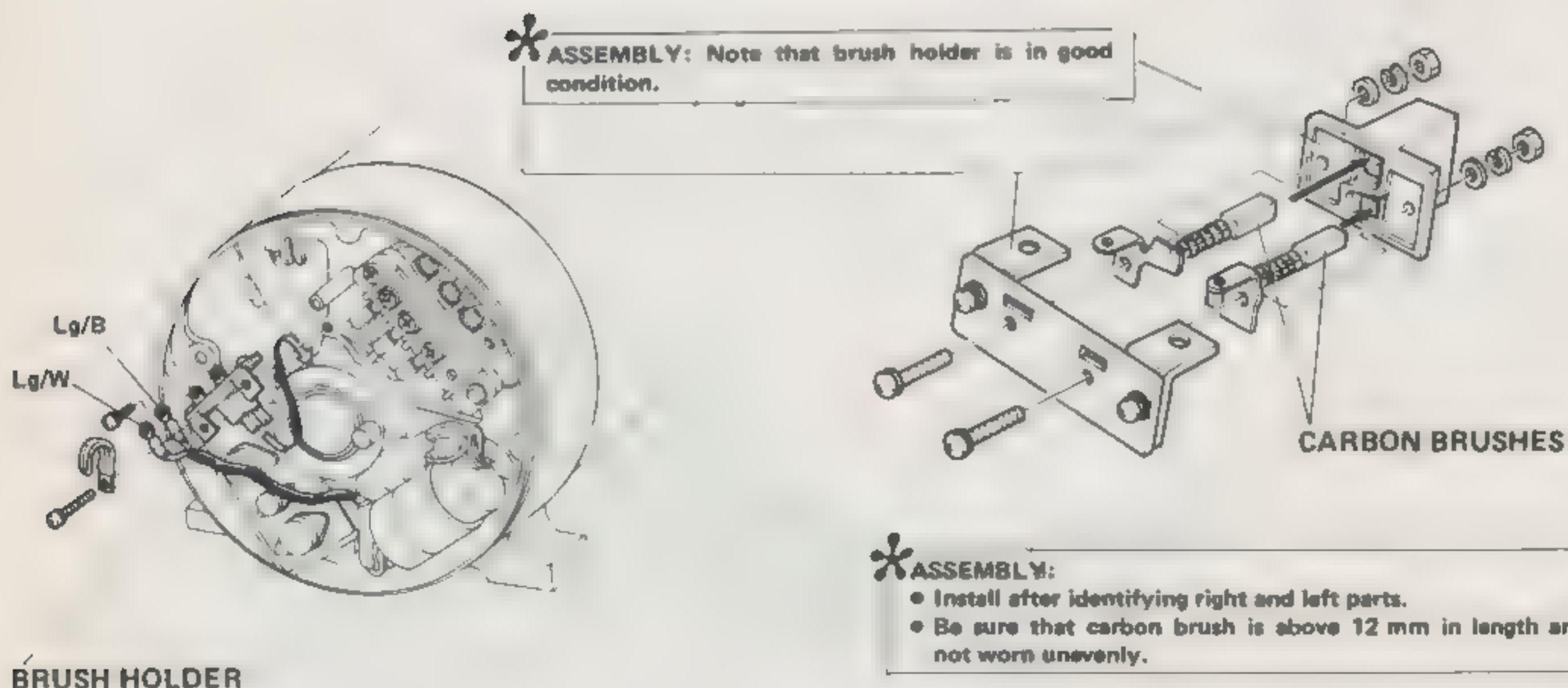
ASSEMBLY

GENERATOR

•A.V.R. (Automatic Voltage Regulator)



•BRUSH HOLDER



BRUSH HOLDER

ASSEMBLY: Make sure that brushes are properly fitted on slip rings.

ASSEMBLY:

- Install after identifying right and left parts.
- Be sure that carbon brush is above 12 mm in length and not worn unevenly.

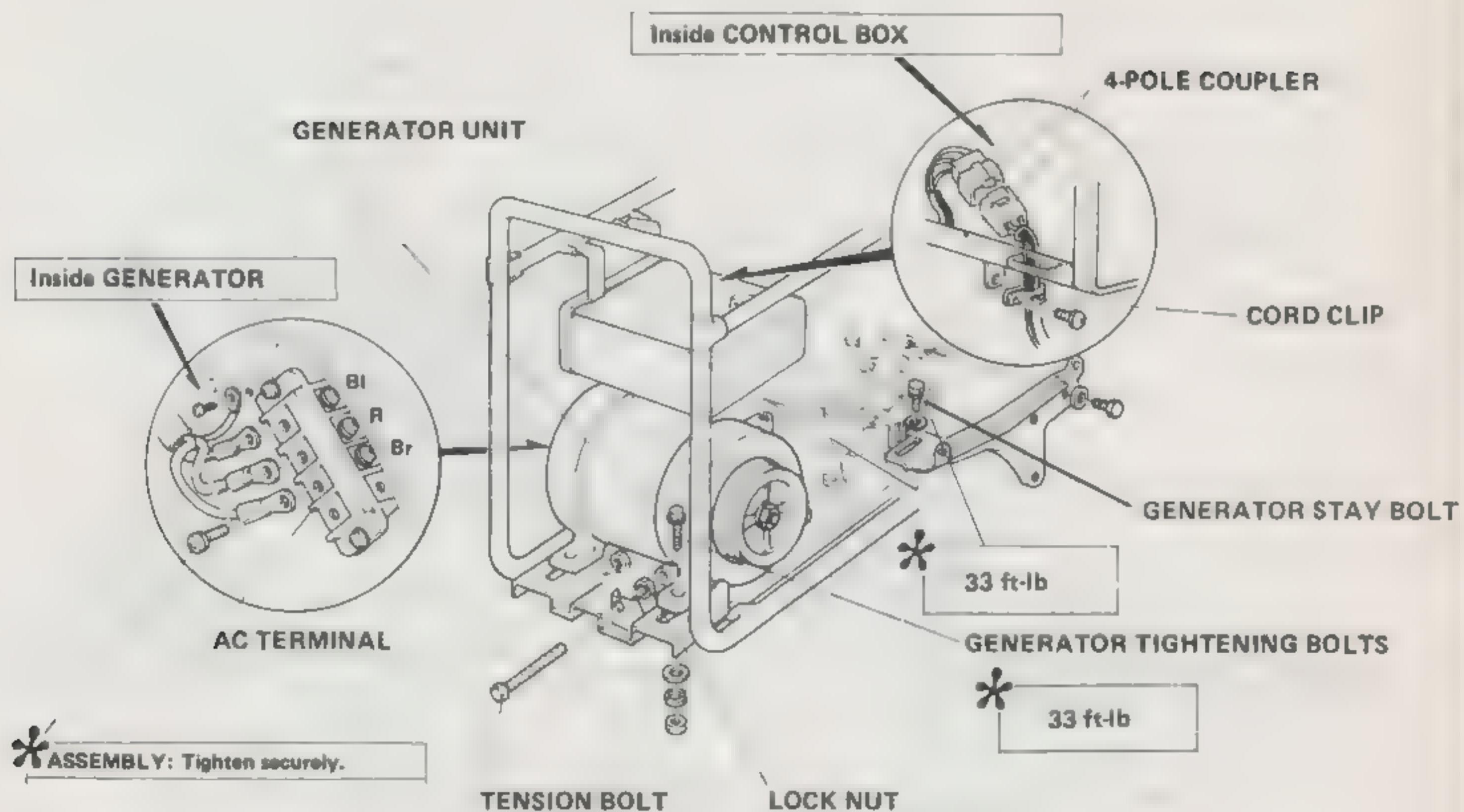
ASSEMBLY

GENERATOR

•REMOVAL GENERATOR UNIT

* After removing these parts showing below, remove the generator unit.

1. BELT COVER, BELT
2. GENERATOR STAY BOLT
3. GENERATOR TIGHTENING BOLTS and NUTS
4. TENSION BOLT and LOCK NUT
5. Disconnect the AC TERMINAL leads
6. Disconnect the 4-POLE COUPLER
7. CORD CLIP



GENERATOR

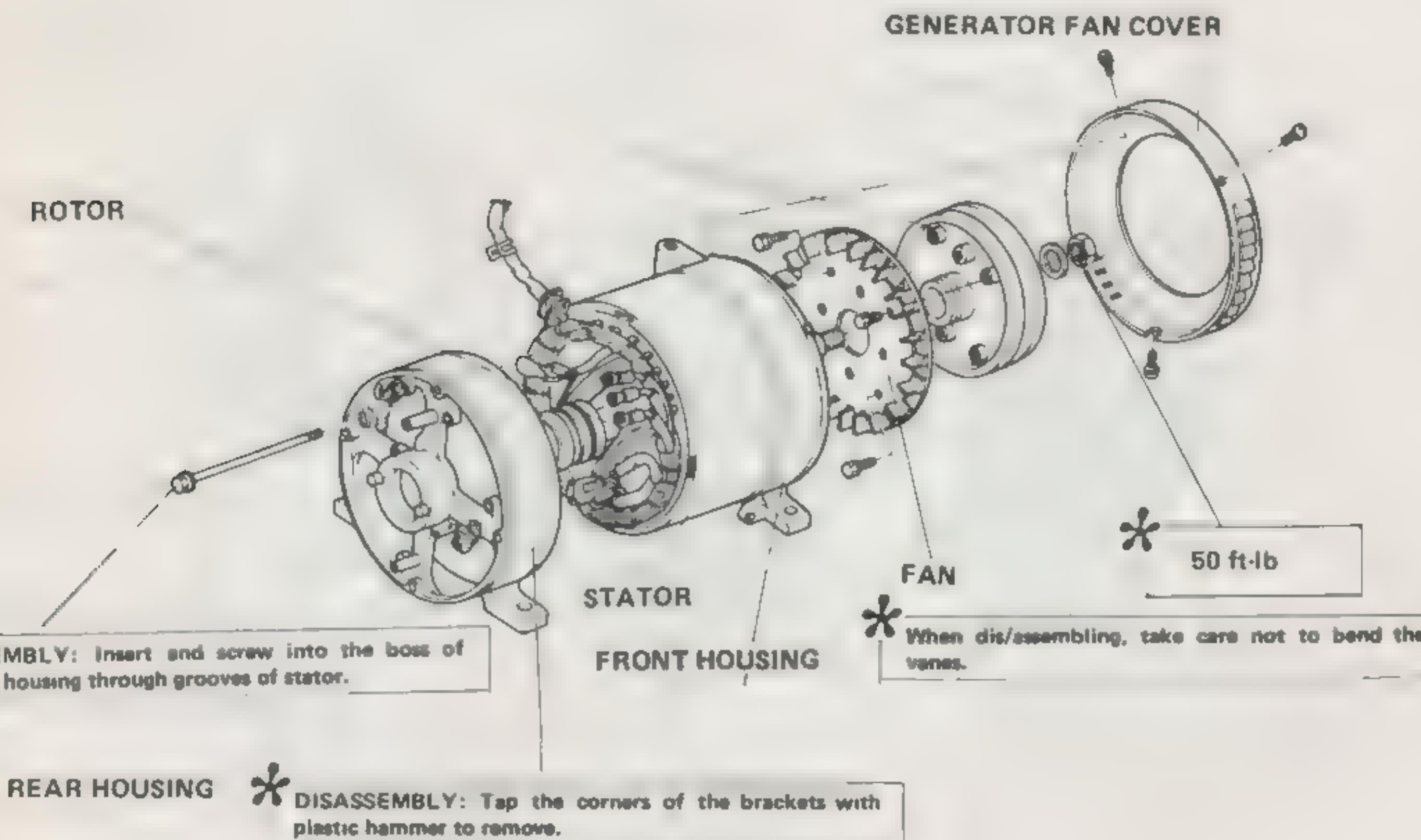
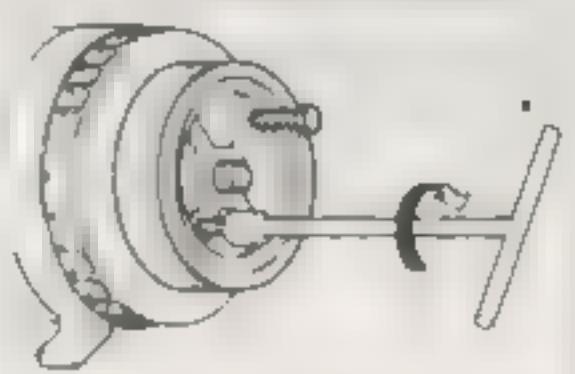
ASSEMBLY

• REAR HOUSING/DRIVEN PULLEY

DRIVEN PULLEY

* **DISASSEMBLY:** After removing fan cover, remove pulley with fan attached.
Use a common puller commercially available, or two 8 x 60 mm bolts as pushing bolts screwing into pulley evenly.

Take care not to damage the generator.



ASSEMBLY

GENERATOR

• ROTOR/STATOR

SLIP RINGS



ASSEMBLY: Before installing, clean away any dirt on slip ring surfaces.



ROTOR



DISASSEMBLY: After loosening off the set plate attaching bolts, lightly tap the rotor end to remove.

BALL BEARING (6304UU)

STATOR



ASSEMBLY: Install with wires facing up.

BALL BEARING (6306UU)

FRONT HOUSING



DISASSEMBLY: Tap the corners of the brackets with plastic hammer off the stator.

BEARING SET PLATE

STATOR COVER



DISASSEMBLY: Straighten the tabs to remove.

GENERATOR

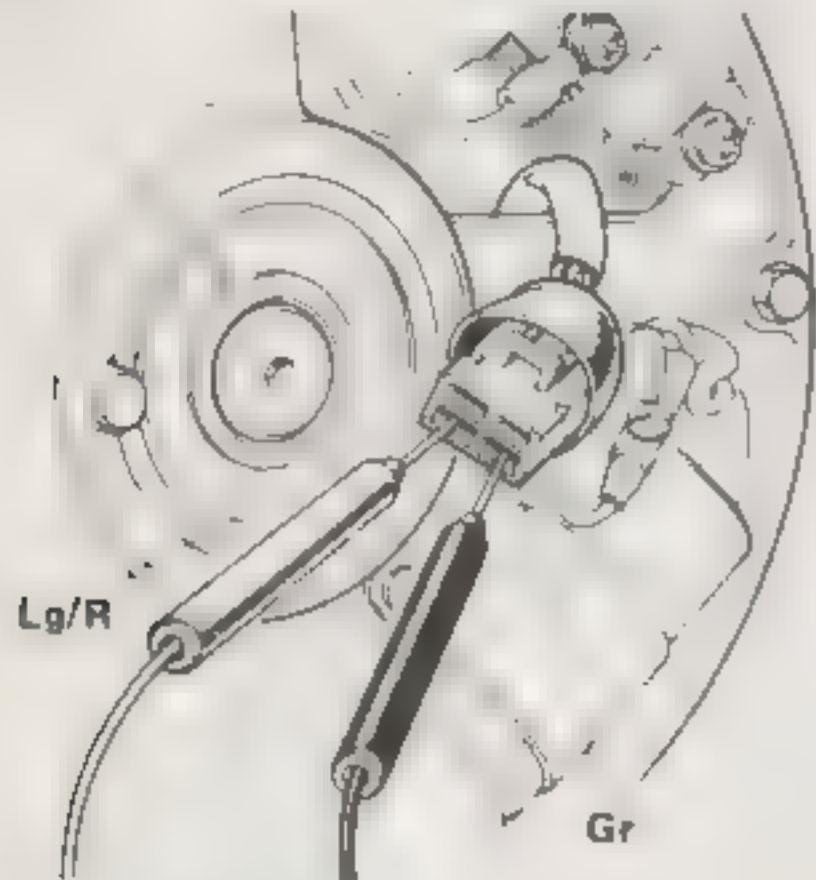
b. INSPECTION



* The main inspection in this block is resistance measuring. Read the resistance between wires shown in illustrations or pictures.
* If out of specification, replace now.

• EXCITER WINDINGS

<TEST 1, 2>



Use care to prevent electric shock when engine is running.

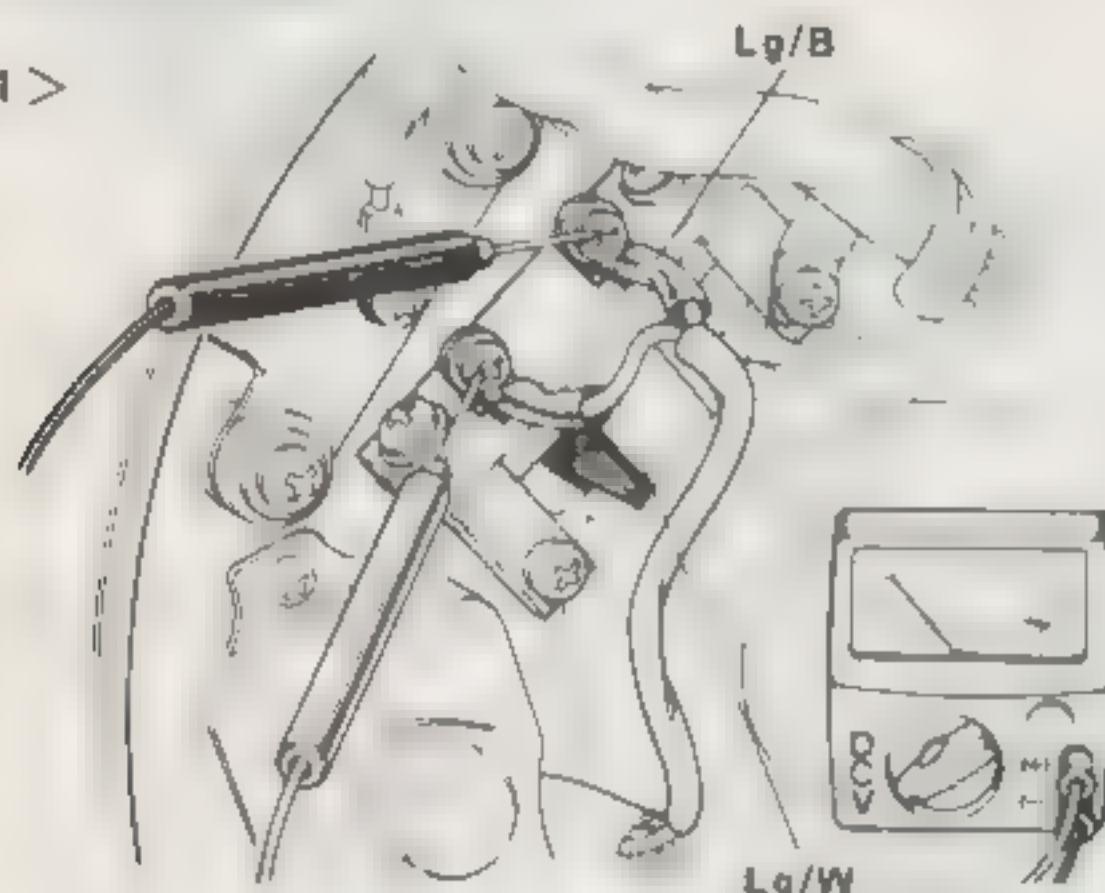
<TEST 1>

* Measure AC voltage between lightgreen/red and green wires with generator turning at rated rpm under no load.
RATED RPM:
Type T,E,G,U 3000 rpm (50 Hz)
Type A,S 3600 rpm (60 Hz)

AC VOLTAGE: 4-6V

• FIELD WINDINGS

<TEST 1>



RESISTANCE VALUE : 15Ω

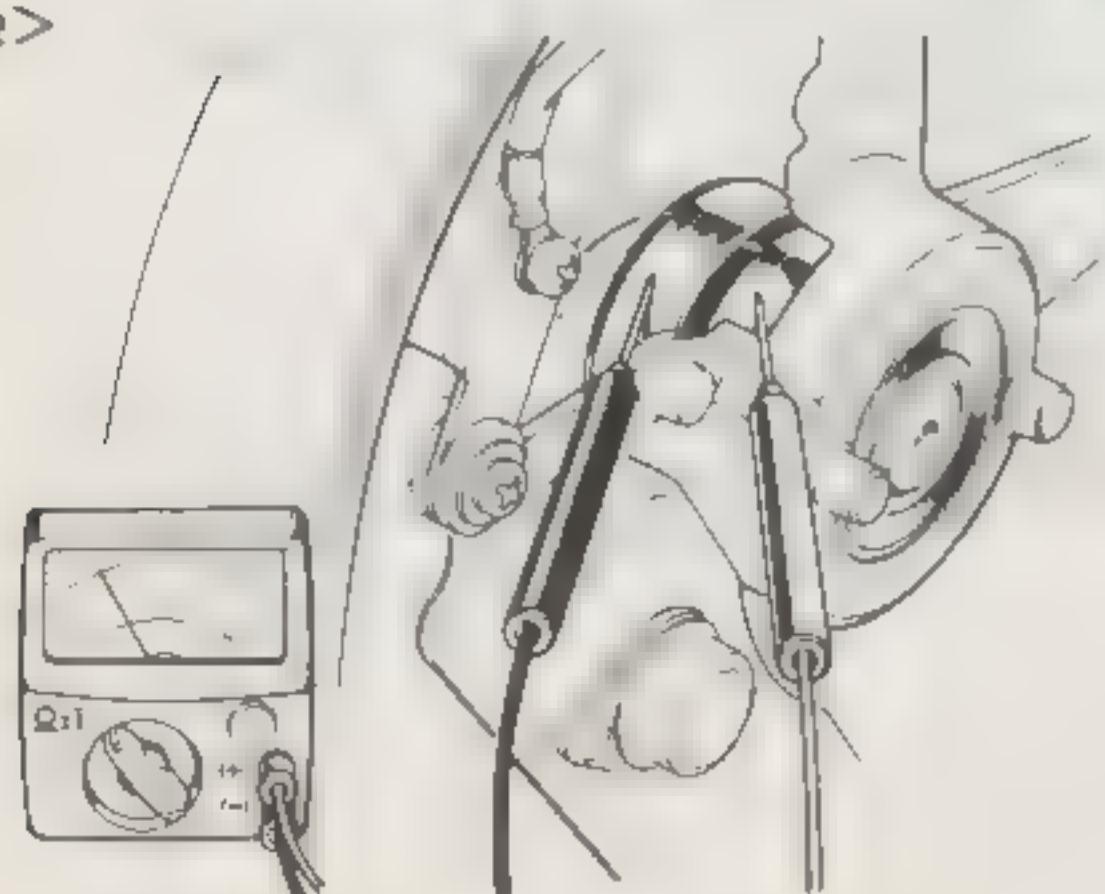
<TEST 1>

* Measure DC voltage with generator turning at rated rpm.

DC VOLTAGE: 20V

* Inspect the main windings if AC output can not be obtained at all with the rated voltage generating in the field windings. (See page 69.)
If rated voltage is not generated, perform the next "TEST 2"
* See the HONDA E3500 TROUBLE SHOOTING CHART (Code no. 8188000A) already issued.

<TEST 2>



<TEST 2>

* Remove the brush holder and measure the resistance between slip rings.

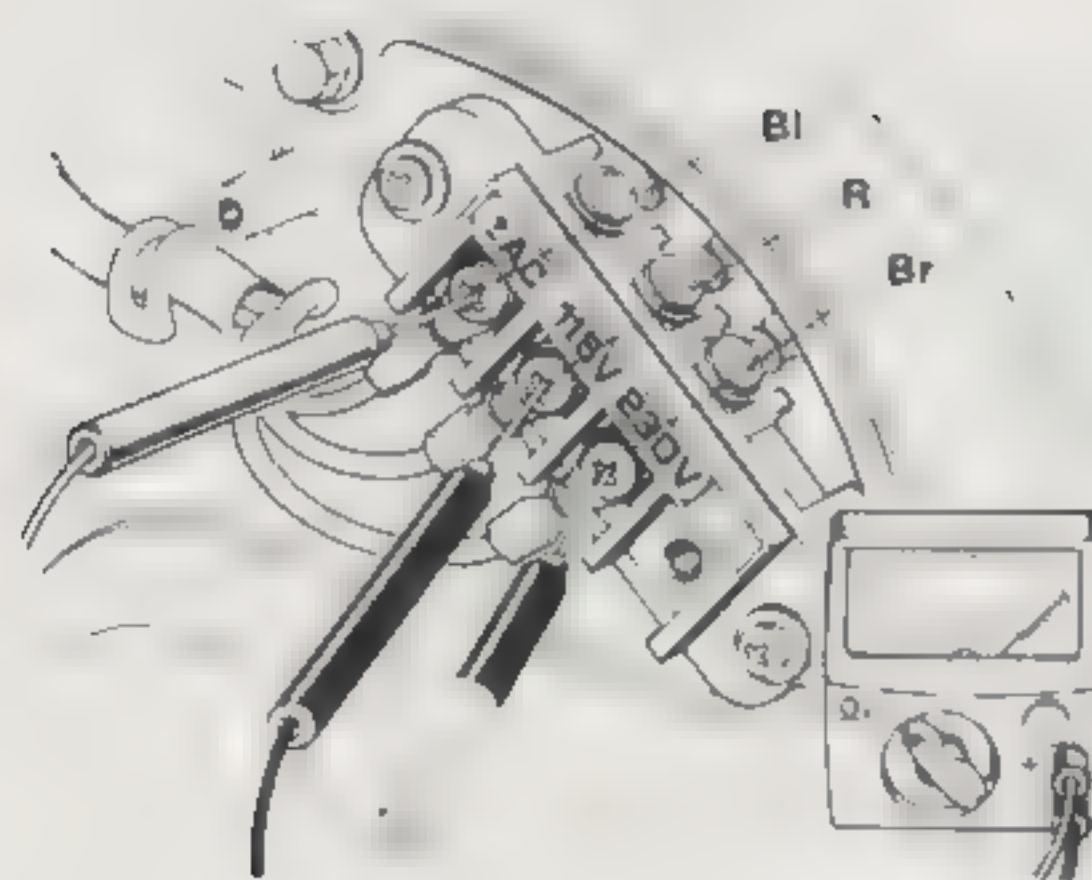
RESISTANCE VALUE: 50Ω

INSPECTION

GENERATOR

• MAIN WINDINGS

<TEST 1>

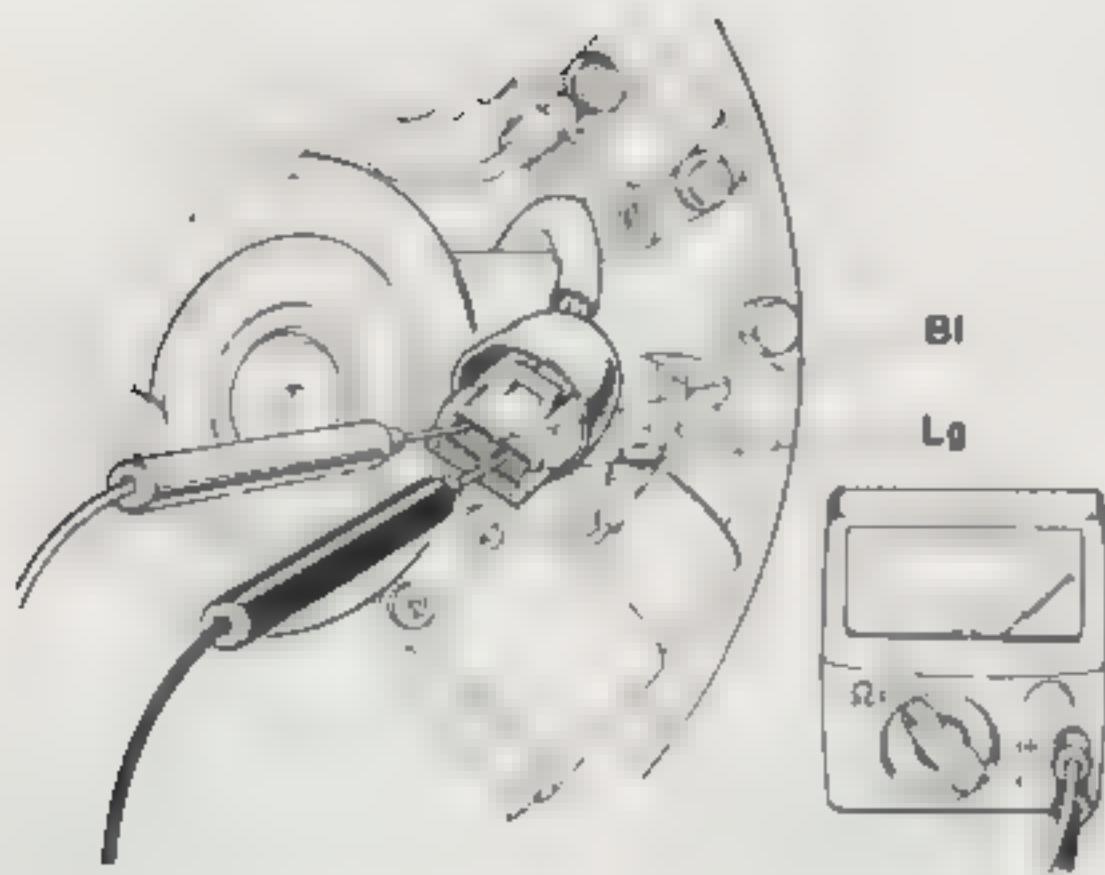


<TEST 1>

* Measure resistance between AC ± (blue) and 115V (red) terminals, or AC ± and 230V (brown).

TERMINAL	RESISTANCE VALUE	
AC ±	115V	0.35 Ω
	230V	1.13 Ω

<TEST 2>



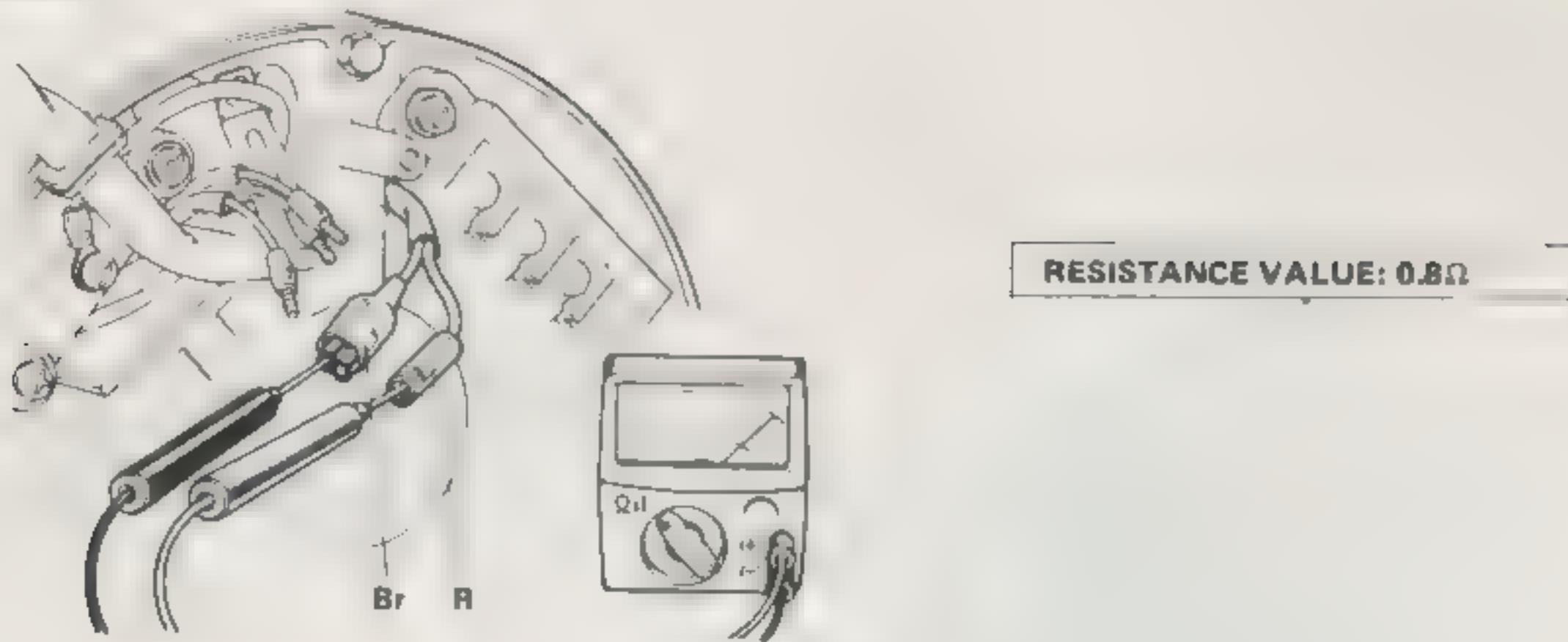
<TEST 2>

* If AC output voltage is excessively high, perform this continuity test.

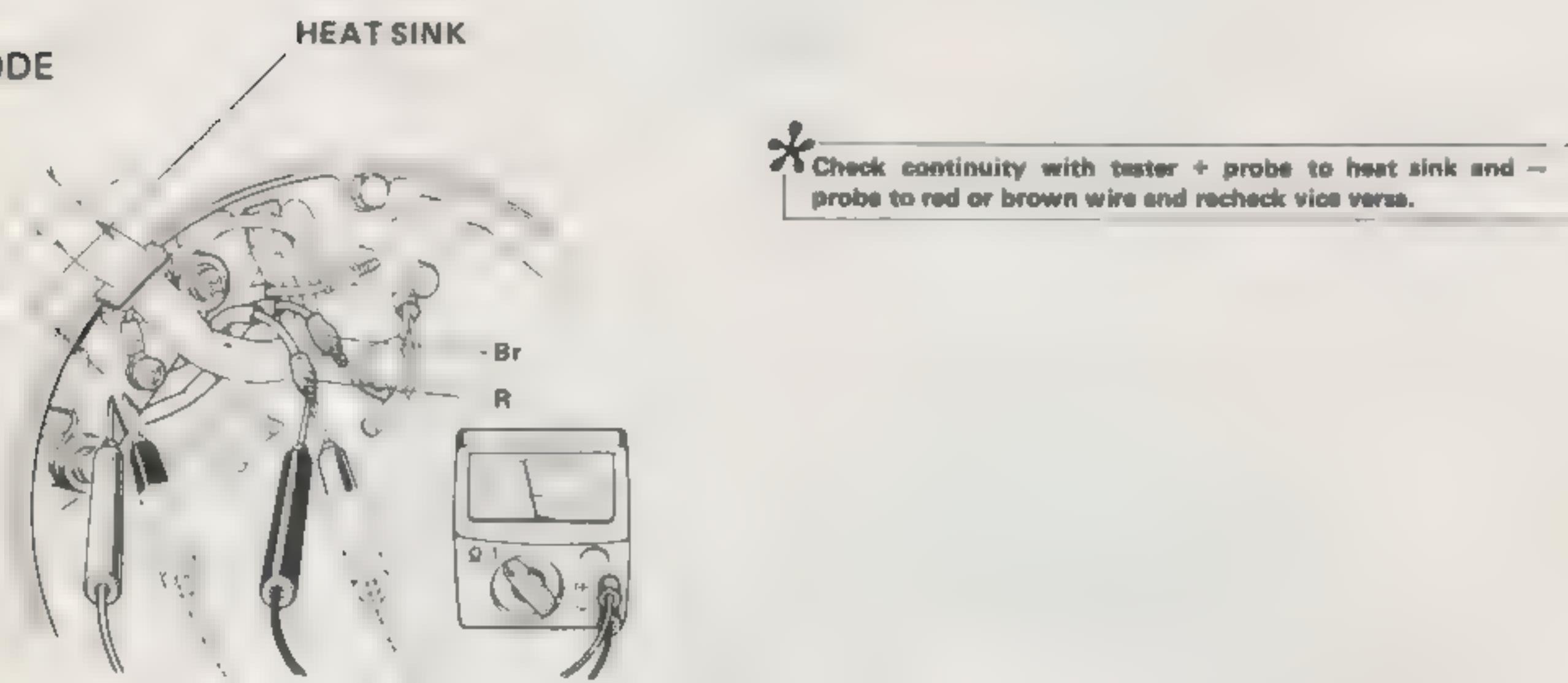
INSPECTION

GENERATOR

• DC WINDINGS



• DC DIODE

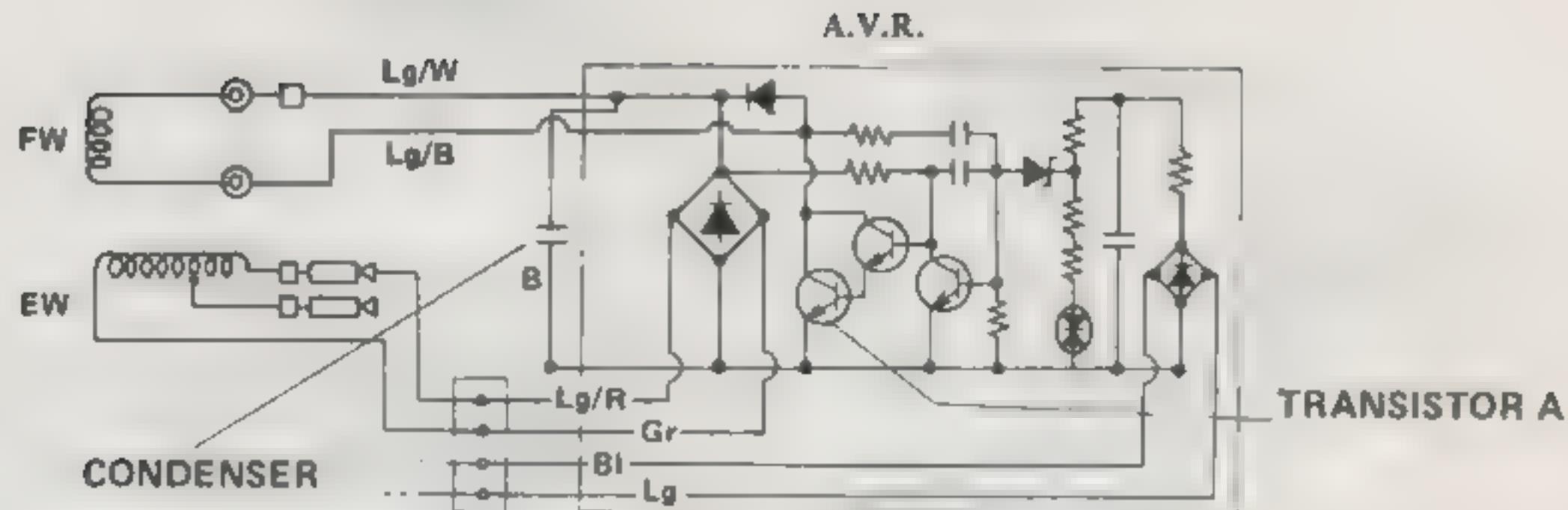


POLARITY OF TESTER		CONTINUITY
(+)	(-)	
HEAT SINK	RED or BROWN	EXIST
RED or BROWN	HEAT SINK	NO CONTINUITY

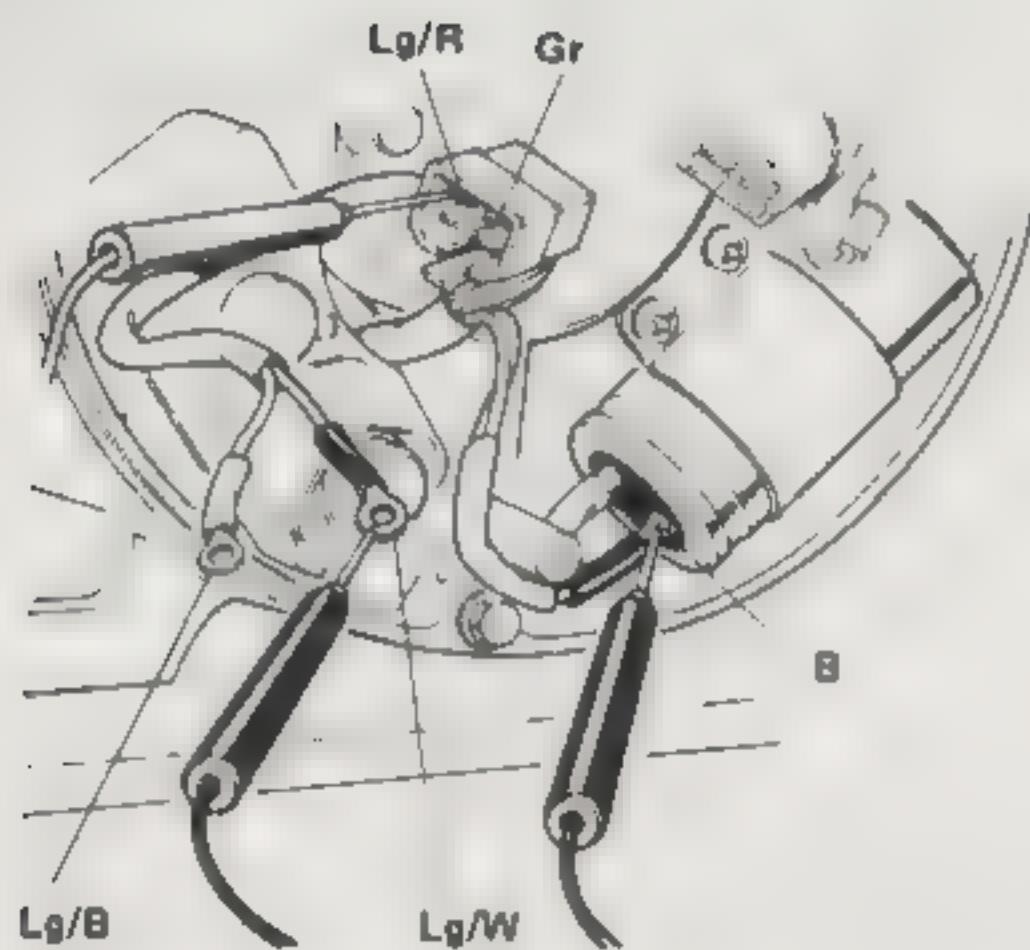
INSPECTION

GENERATOR

• A.V.R.



<TEST 1>



* If no output is obtained or voltage is low, perform the TEST 1 and 2.

<TEST 1>

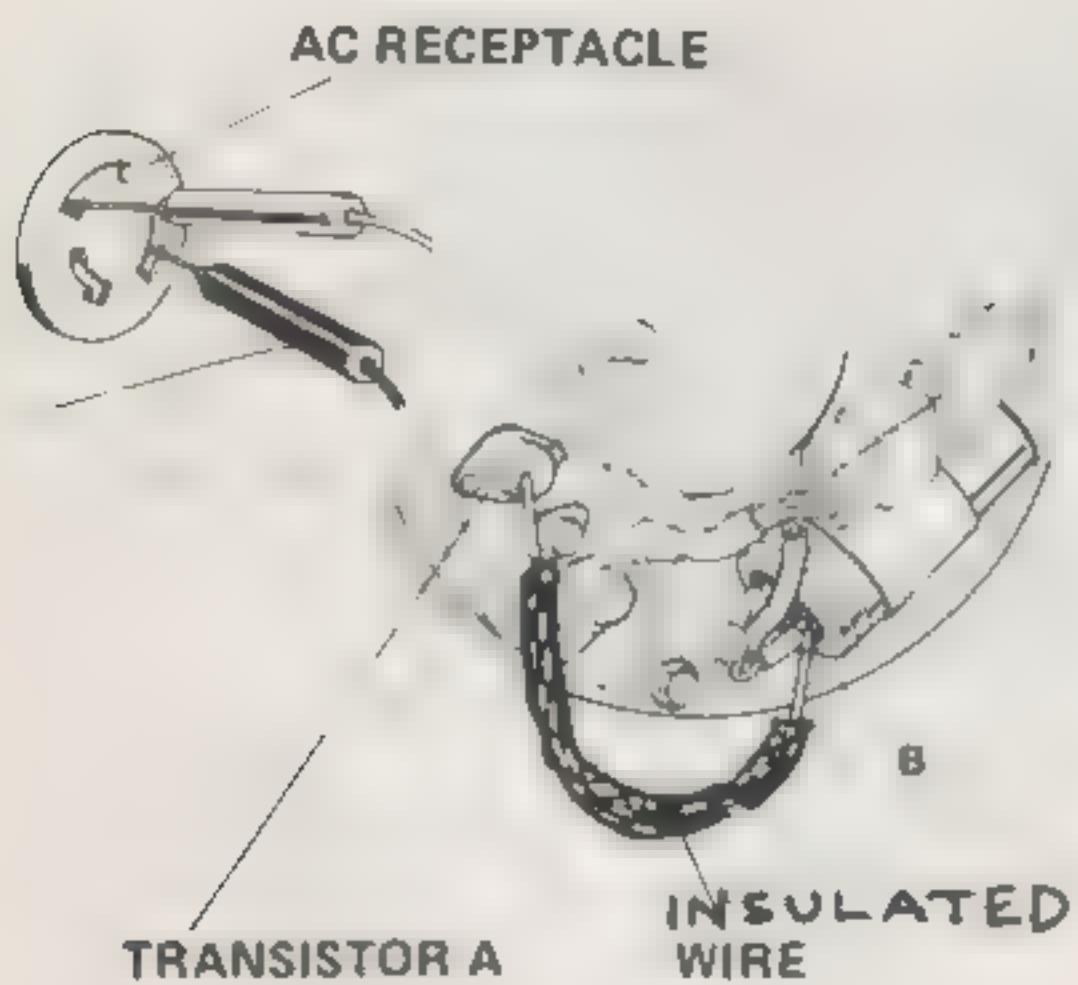
* Check continuity with all wires in A.V.R. disconnected.

POLARITY OF TESTER		CONTINUITY
(-)	(+)	
Lg/B	Lg/W	No continuity
Lg/W	Lg/B	Continuity
B	Lg/R	No continuity
Lg/R	B	Continuity
B	Gr	No continuity
Gr	B	Continuity
Lg/R	Lg/W	No continuity
Lg/W	Lg/R	Continuity
Gr	Lg/W	No continuity
Lg/W	Gr	Continuity

GENERATOR

INSPECTION

<TEST 2>

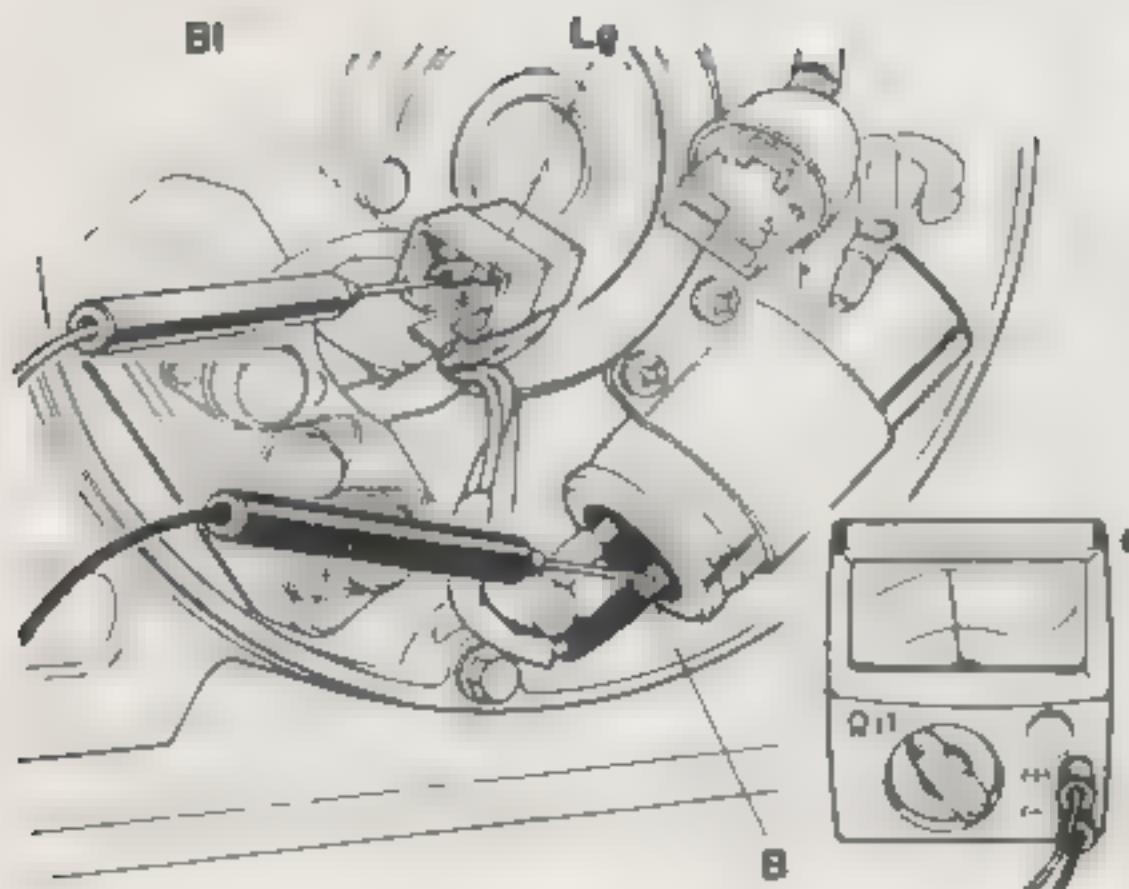


Use care to prevent an electric shock when engine is running.

<TEST 2>

- * After making connections of all wires in A.V.R., inspect with engine running at generator rated rpm.
- Measure output voltage while connecting between condenser Black terminal and transistor A with a suitable wire as shown.
- Replace A.V.R. as an unit if 130–140% voltage as compared to the rated voltage is measured within 2 sec. after shortcircuiting.
- Make sure to short-circuit only for 2 sec. and measure under no load. Though a spark occurs when disconnecting short-circuiting wire, no damage results in A.V.R.

<TEST 3>



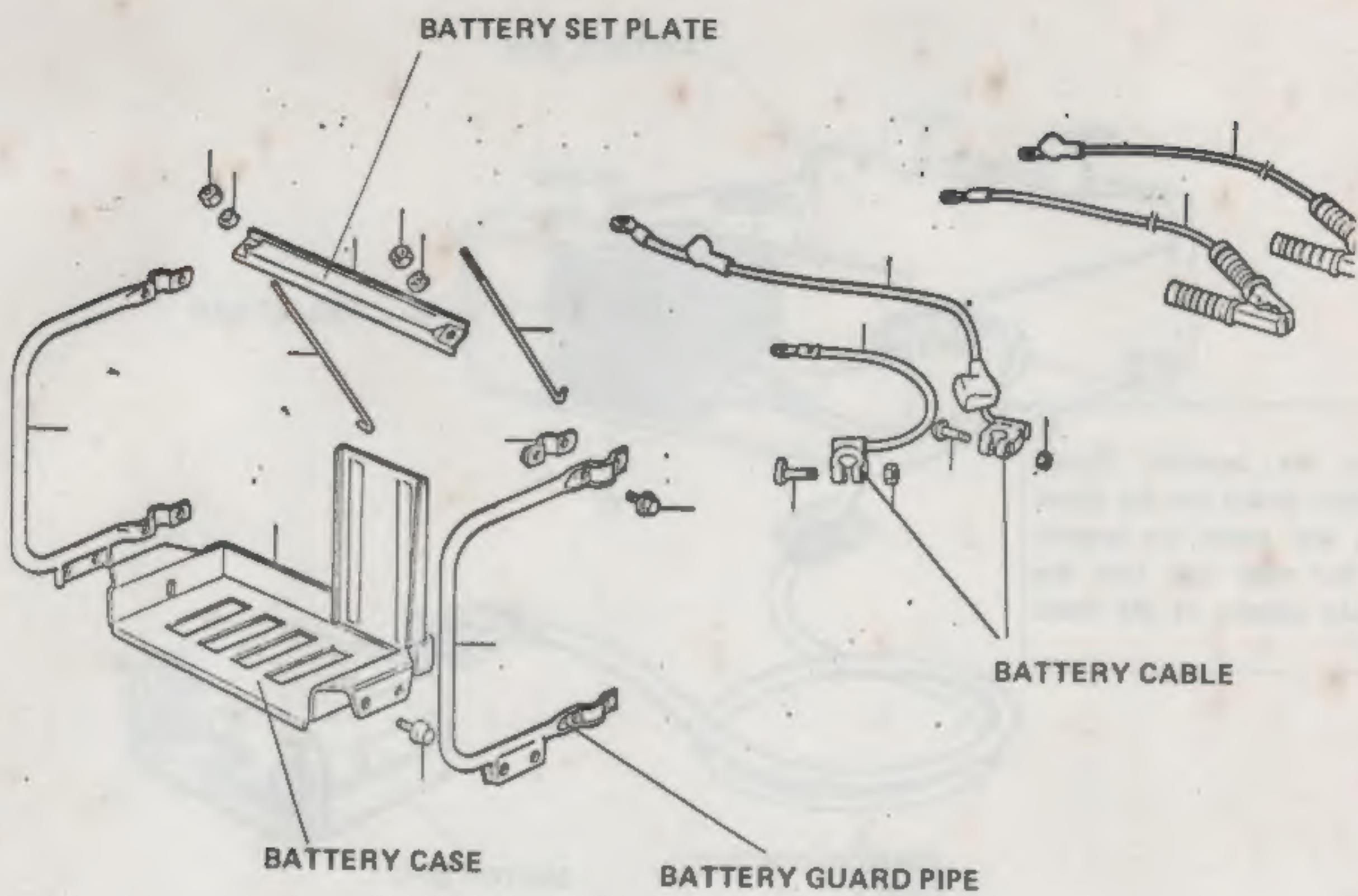
<TEST 3>

- * Check continuity with all wires in A.V.R. disconnected.

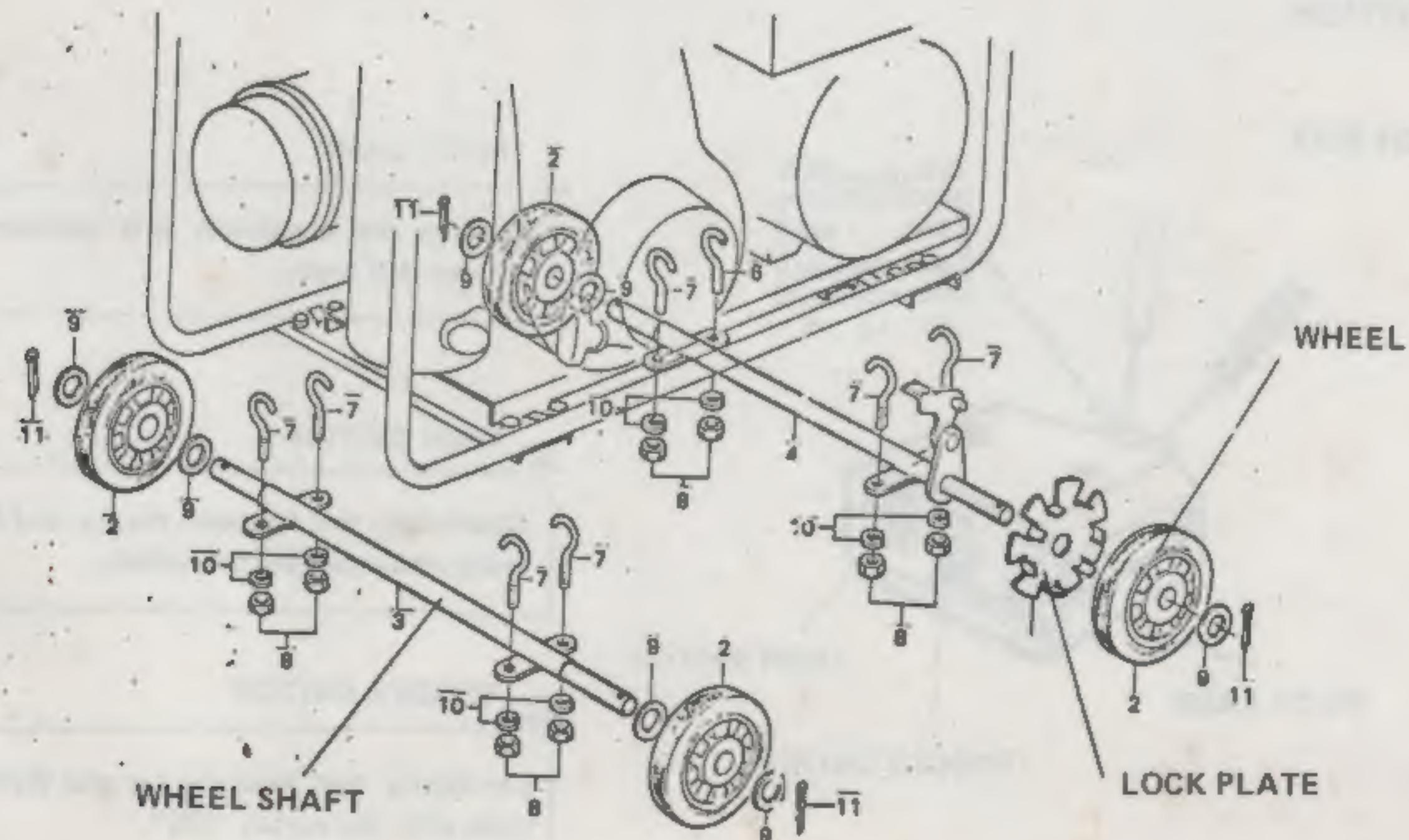
POLARITY OF TESTER		CONTINUITY
(+)	(-)	
B	BI	No continuity
BI	B	Continuity
B	Lg	No continuity
Lg	B	Continuity

OPTIONAL PARTS

• BATTERY TRAY KIT

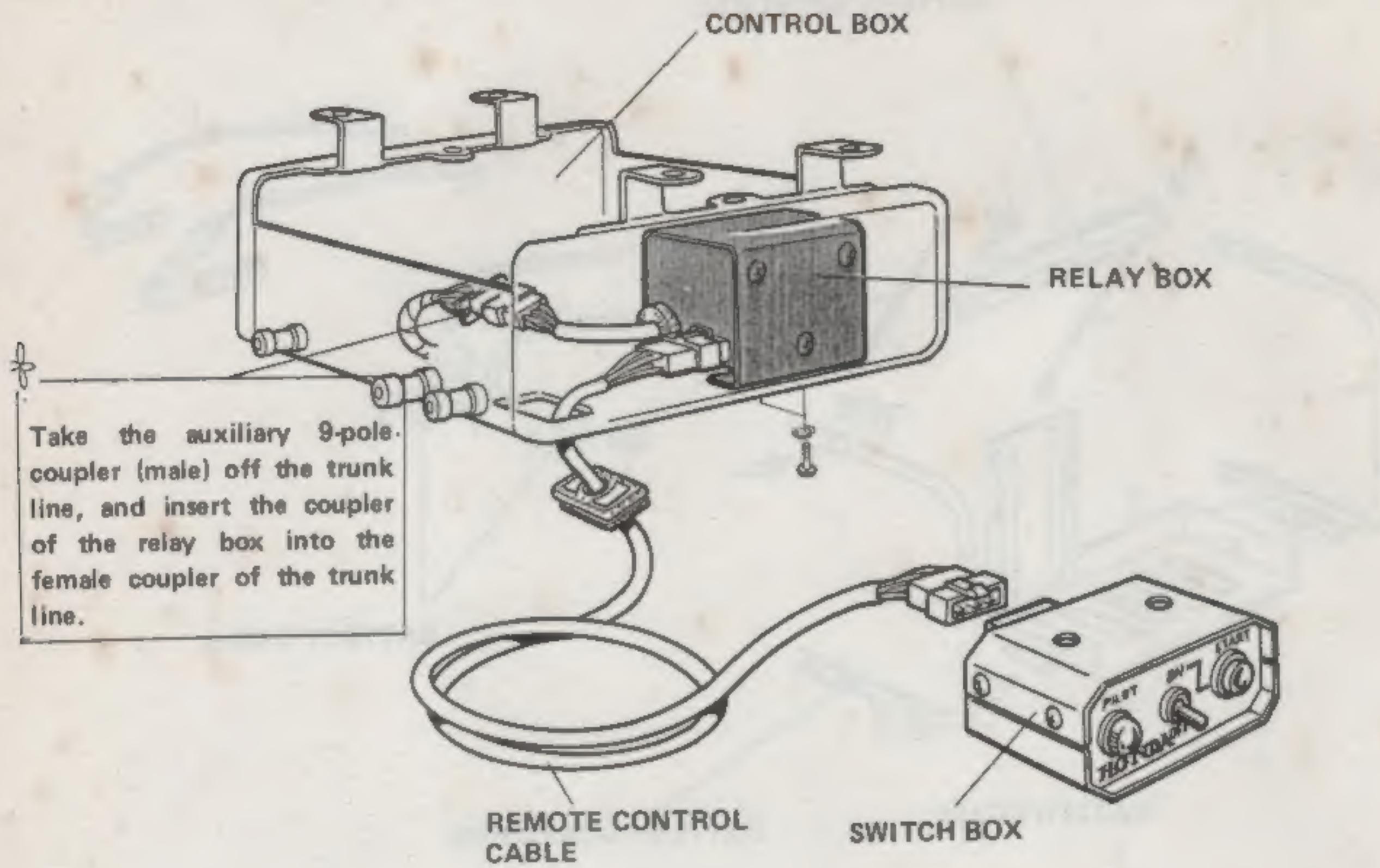


• WHEEL KIT



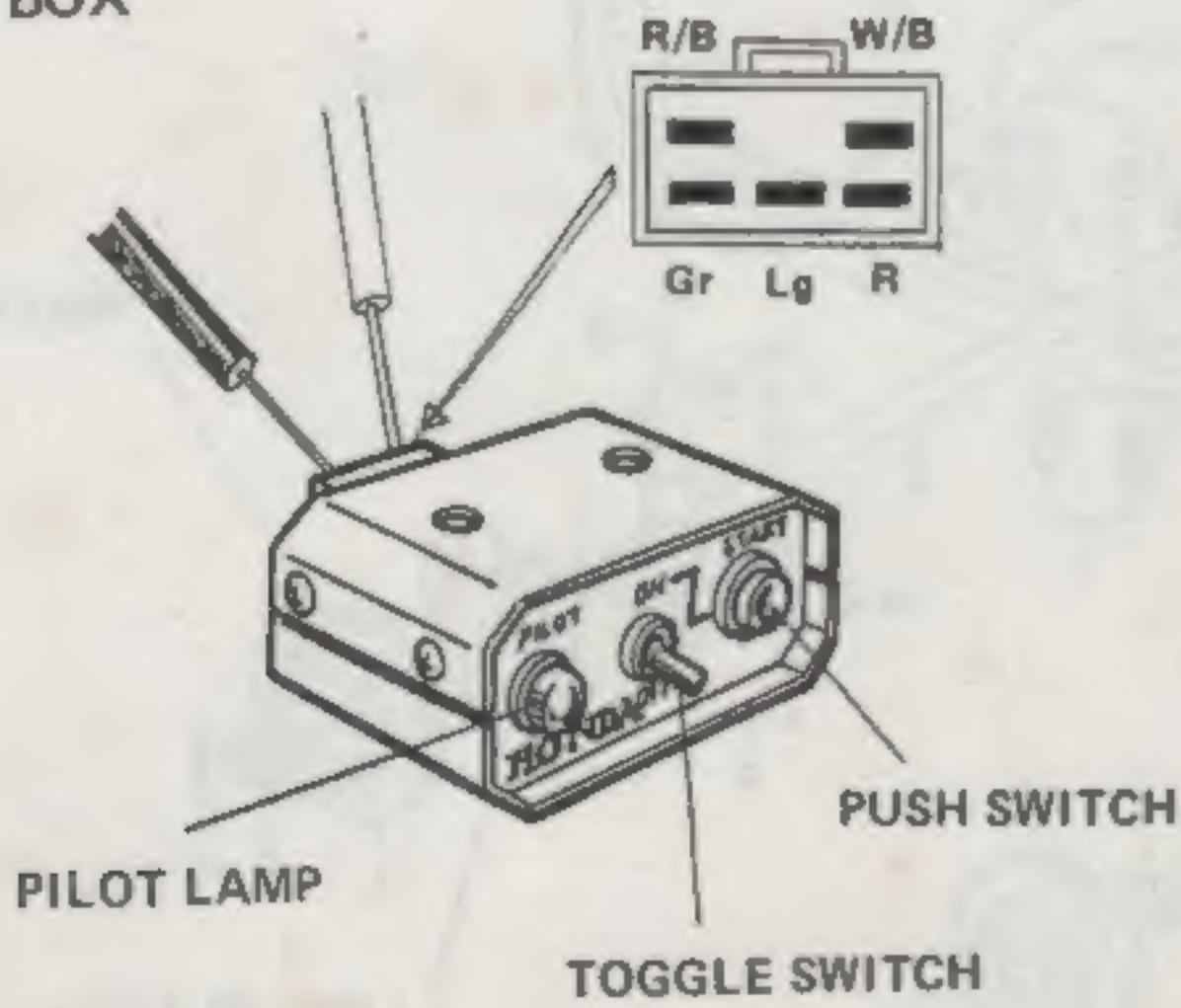
OPTIONAL PARTS

- REMOCON KIT



b. INSPECTION

- SWITCH BOX



PILOT LAMP

Perform the continuity test between Gr and R/B leads.

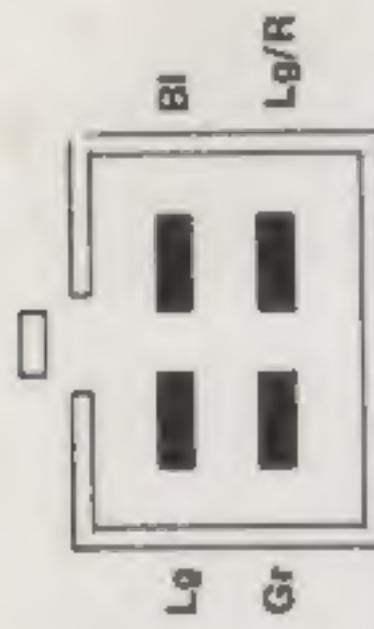
PUSH SWITCH

Continuity test between the Lg and R leads while pushing the switch.

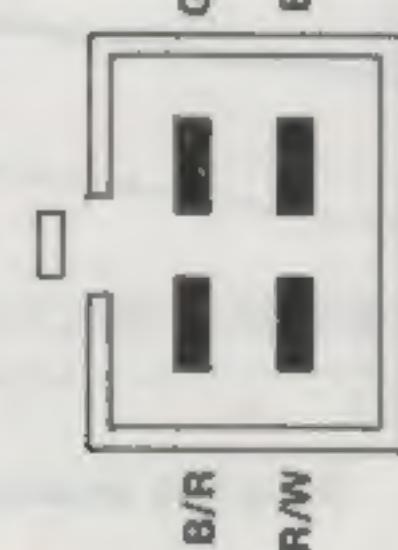
TOGGLE SWITCH

Continuity test between Lg and W/B leads with the switch "ON".

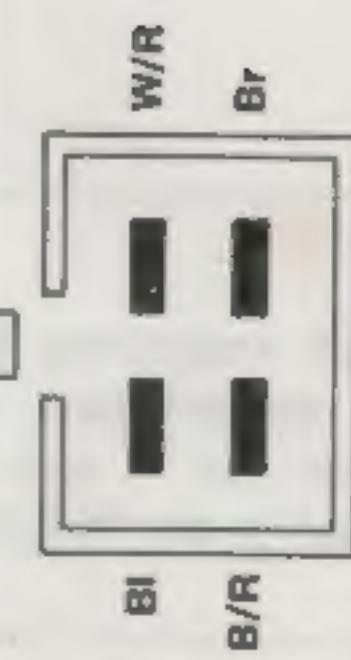
Part Name	
ACS	Automatic Choke Solenoid
AVR	Automatic Voltage Regulator
Bt	Battery
CBr	Circuit Breaker
CBx	Control Box
ChC	Charging Coil
CoB	Contact Breaker
CP~	~P Connector
DCW	DC Winding
EgB	Engine Block
ESw	Engine Switch
ET	Earth Terminal
EW	Exciter Winding
FCS	Fuel Cut Solenoid
FM	Frequency Meter
(F) M	Frequency Mark
Fu	Fuse
FW	Field Winding
GeB	Generator Block
IC	Ignition Coil
MW	Main Winding
OR	Output Receptacle
OT	Output Terminal
PL	Pilot Lamp
RCB	Remote Control Box
RESw	Remote Engine Switch
RIB	Relay Box
RPL	Remote Pilot Lamp
RSw	Remote Control Switch
SB	Starting Button
SM	Starting Motor
SP	Spark Plug
TSw	Thermostat Switch
(+) M	+ Mark
	Color
B	Black
Bl	Blue
Br	Brown
Gr	Green
Lg	Light Green
R	Red
W	White
Y	Yellow



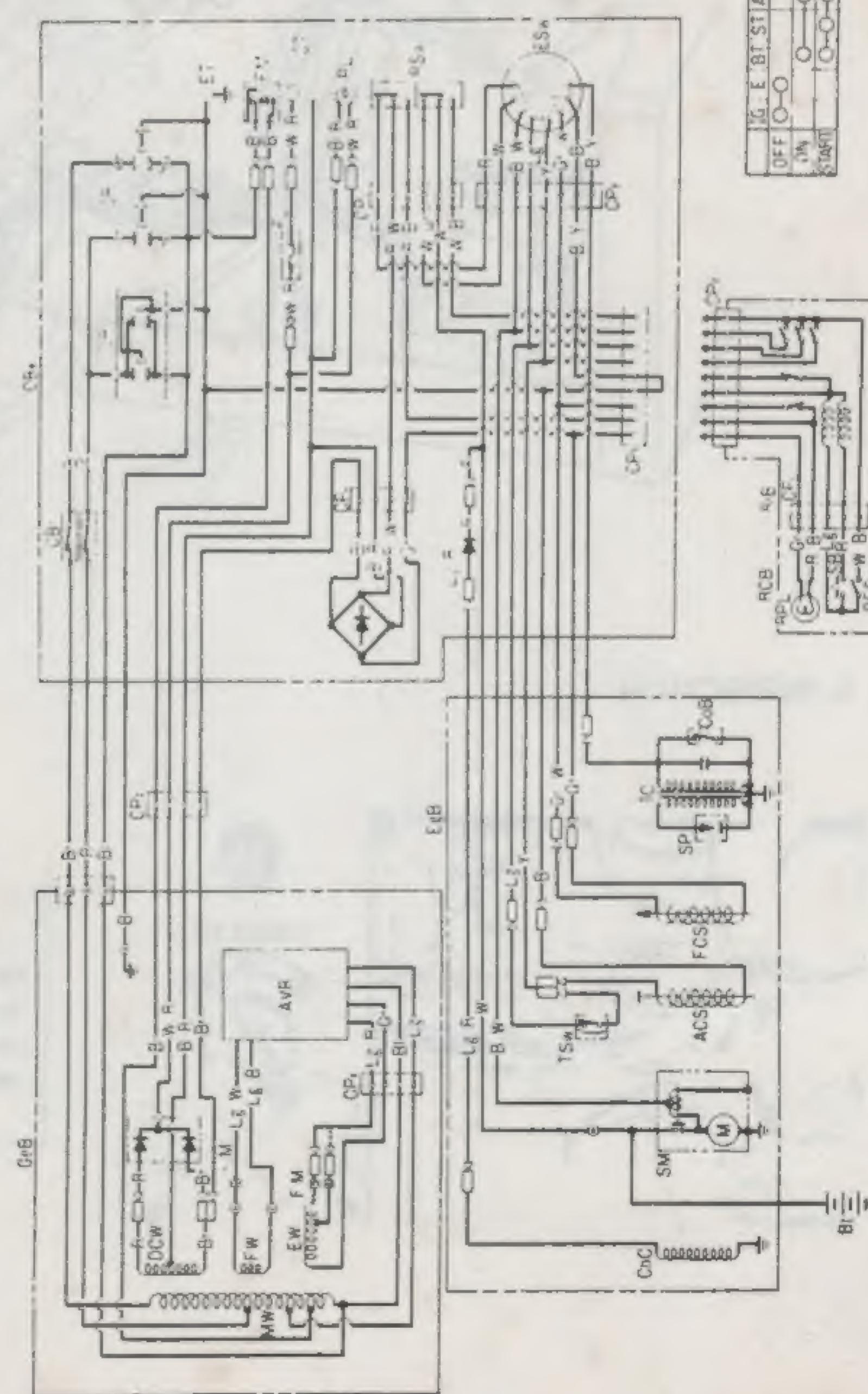
MALE COUPLER (A.V.R. side)



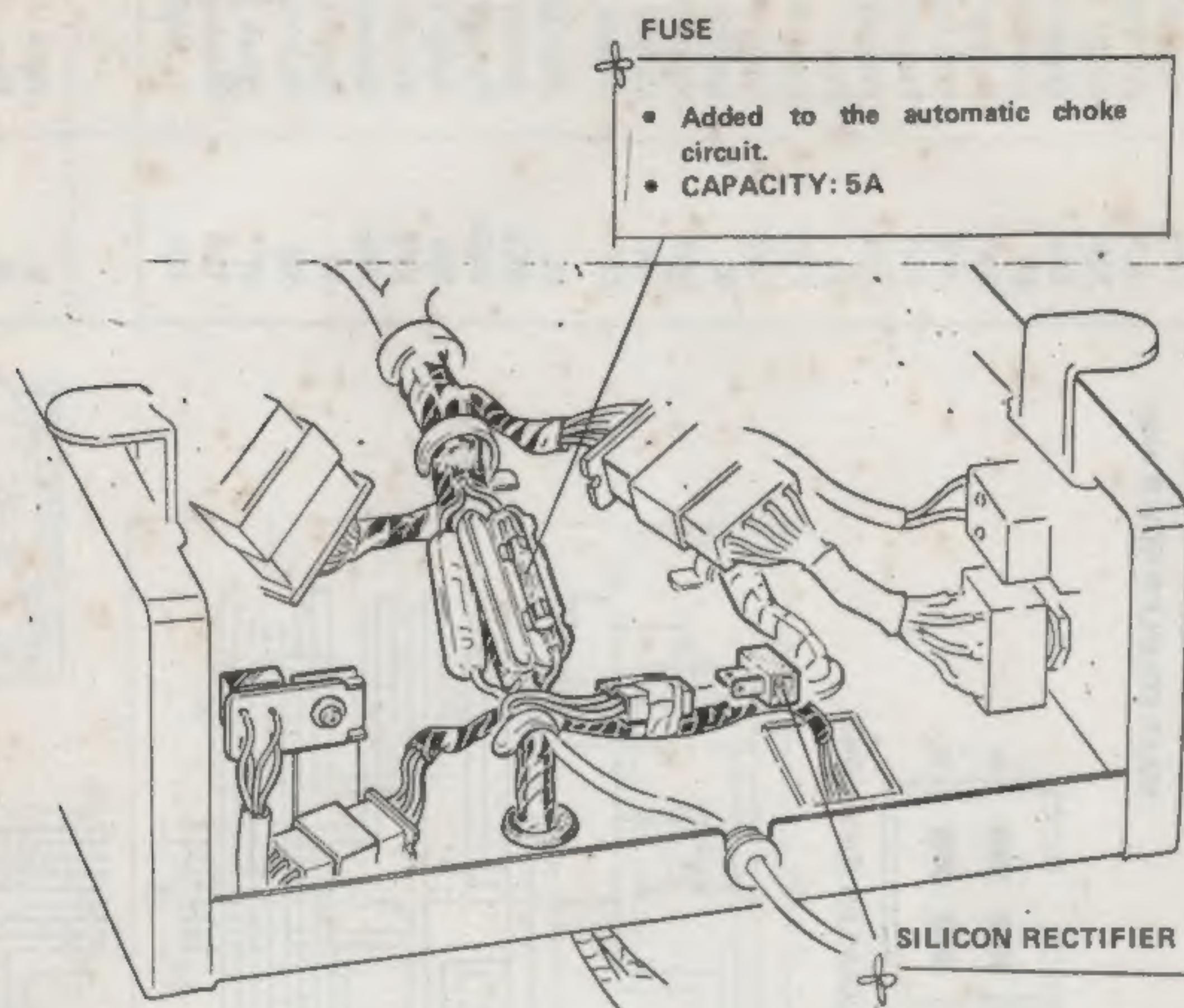
MALE COUPLER (Diode side)



MALE COUPLER (Control box side)



SUPPLEMENT (CHANGES AFTER FIRST _____ UNITS)



b. INSPECTION



When inspecting the fuse without opening the control box, check the continuity between the Y and Lg leads with the engine switch in the "START" position.